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THE

SPECIAL KINESIOLOGY

OF

EDUCATIONAL GYMNASTICS

BY

THE BARON NILS POSSE M.G.

(GRADUATE OF THE ROYAL GYMNASTIC CENTRAL INSTITUTE STOCKHOLM SWEDEN)
SPECIAL SWEDISH COMMISSIONER TO THE WORLD'S COLUMBIAN EXPOSITION
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DIRECTOR OF THE POSSE GYMNASIUM BOSTON

WITH TWO HUNDRED AND SIXTY-SEVEN ILLUSTRATIONS
AND AN ANALYTIC CHART

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EDUCATIONAL GYMNASTICS

TYPOGRAPHY BY C. J. PETERS & SON BOSTON

PRESSWORK BY ROCKWELL AND CHURCHILL

DEDICATED

TO THE

Pupils of the Posse Gymnasium

AND TO THOSE

FRIENDS OF PHYSICAL EDUCATION

WHOSE KINDLY INTEREST HAS ENCOURAGED THE AUTHOR
IN HIS WORK FOR

GYMNASTICS

AS A LIBERAL ART, AS A COSMPOLITAN SCIENCE,

AND AS A

UNIVERSAL TRUTH

PREFACE

SINCE the second edition of *The Swedish System of Educational Gymnastics* became exhausted, and a third edition was rendered necessary, I have used the opportunity to rewrite and elaborate the book so as to make it more suitable as a text-book for students of gymnastics.

While I have deemed it desirable to change the title into *Special Kinesiology*, — it being a treatise on the mechanics, effects, and classification of special exercises, — the subject-matter still describes the Swedish system of educational gymnastics. I consider the change warranted, partly because of the vaster scope of the book, partly because gymnastics is fast passing into the stage where prefixes of nationality must disappear, and where the broadness of its spirit must leave its imprint even on the name. This, however, does not oppose the fact that Swedish gymnastics must be the basis of all *rational* gymnastics, since, to-day, it is the only system whose details have been elucidated by and derived from mechanics, anatomy, physiology, and psychology, and whose theory has survived the scrutiny of scientists all over the world; so that, whatever the name or form of the gymnastics of the future, the Swedish system will be its frame, as, even now, we see it transforming and absorbing all so-called systems.

I use this opportunity to emphasize my standpoint as a true Swedish gymnast, and to stigmatize as *irrational* the "broad" basis of the eclectic school, i.e., those who take the best from

everything, and teach but little in accordance with the principles of gymnastics. To teach Swedish *exercises* is not necessarily to teach Swedish *gymnastics;* and to apply "Swedish drill," or any other kind, with a repetition of the same table of exercises for several weeks in succession, has nothing in common with the subject of this book; viz., *educational* gymnastics. Gymnastics is educational only when one adheres to the principles of education; and it is Swedish only when it is applied in accordance with General Kinesiology, i.e., with the principles of gymnastics.

I have been so often misquoted as approving of dumb-bell drills, fancy exercises on horizontal and parallel bars, etc., that I deem it desirable to say, 1st, That I believe such exercises excellent for far-advanced pupils as a means of recreation, and for the development of physical skill, yet never in the form of "drills;" 2d, That I stand for Swedish gymnastics as long as the beautiful principles of Ling are not violated by narrow restrictions.

In this book I have attempted to give an *exposé* of the science of educational gymnastics to the extent that my own investigation, research, and actual experience have made possible. No one to-day can *invent* a system of physical education; he can merely repeat long-proven truths, and add more detail to the knowledge already defined by science.

BARON NILS POSSE.

POSSE GYMNASIUM, 23 IRVINGTON STREET,
Boston, Mass., U.S.A.

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EDUCATIONAL GYMNASTICS

PART I

GENERAL GYMNASTIC THEORIES

DEFINITIONS.

THE WORD **Gymnastics** is generally understood as meaning systematic exercise of the muscles for the restoration of health, and for the development and preservation of the physical powers. The complete subject might be best expressed by the subjoined synopsis: —

- BODILY MOVEMENTS.
  - *Exercise.* — Any Bodily Movement, random or otherwise.
  - *Gymnastics, or Systematic Exercise.*
    - Medical
      - Manual
        - Massage.
        - "Swedish Movements."
      - Mechanical
    - Hygienic
      - Attentive
        - Educational.
        - Military.
        - Æsthetic.
      - Recreative
        - Games and Dances.
        - Sports.
        - Athletics.

The aim of gymnastics primarily is ~~health~~. When applied to the sick, the exercises are based on pathological considerations and are called medical; when applied to the well, they are called hygienic and are constructed on physiological principles. While the typical movements of each branch may differ widely, yet hygieno-gymnastic movements are sometimes used for therapeutic purposes, and medico-gymnastic exercises for hygienic and educational effects, one branch aiding and com-

The comparative value[1] of exercises can be said to depend upon their corrective effects; and a knowledge of the needs and means in this direction is a "guide which adopts and rejects, compares and prefers." To fill the bodily needs the movements must be so constructed as to comply with the laws of the body; for only injurious effects can be expected from movements violating these laws. Man being a machine, an organism, and a thinking individual, the exercises must be chosen for their effects upon this threefold nature. The purpose of the exercise will decide its construction in accordance with the laws of mechanics, physiology, and psychology, and local effects have to be considered as well as general. Physical culture being one of the body as a whole, general effects should be thought of first, and local effects should be given attention only in so far as they will assist in producing the general harmony by developing undeveloped parts. The reaction of a movement should not be forgotten while we consider the immediate effects.

The properties of the muscles being the leading qualities of the body, the movements should develop an equilibrium of contractility, extensibility, and of their offspring, elasticity. Thus it would be incorrect to give heavy work to athletes with overdeveloped muscles, and "relaxing exercises" to young ladies already abnormally relaxed. If pupils are left to choose for themselves, they usually practise that which is the easiest for them — which is invariably that which they need the least.

If exercises are applied for the pupil's welfare, pay slight heed to the appearance ~~of the movement~~ as long as it accomplishes its object. On the other hand polish the exercises as far

[1] Prof. Hj. Ling has said that "the gymnastic value of an exercise depends upon how it combines the greatest effect on the body with simplicity and beauty of performance."

as possible, and also bear in mind that good form in execution usually decides the extent of the effect. Movements should never be chosen for their effects upon the looker-on; but if an exhibition is to be given, it is not necessary to select unattractive exercises. Remember not to waste time in drilling, for, at any time, that which is well done and gymnastically correct is well worth looking at.

Choose your exercises so that the greatest results will be accomplished in the shortest possible time; on the other hand, do not hurry for the sake of variety.

Make your exercises correspond to whatever apparatus you happen to have; construct them generally so that they will fit any kind of paraphernalia; and do not construct new movements for the sake of seeing how many different things you can do on a certain machine.

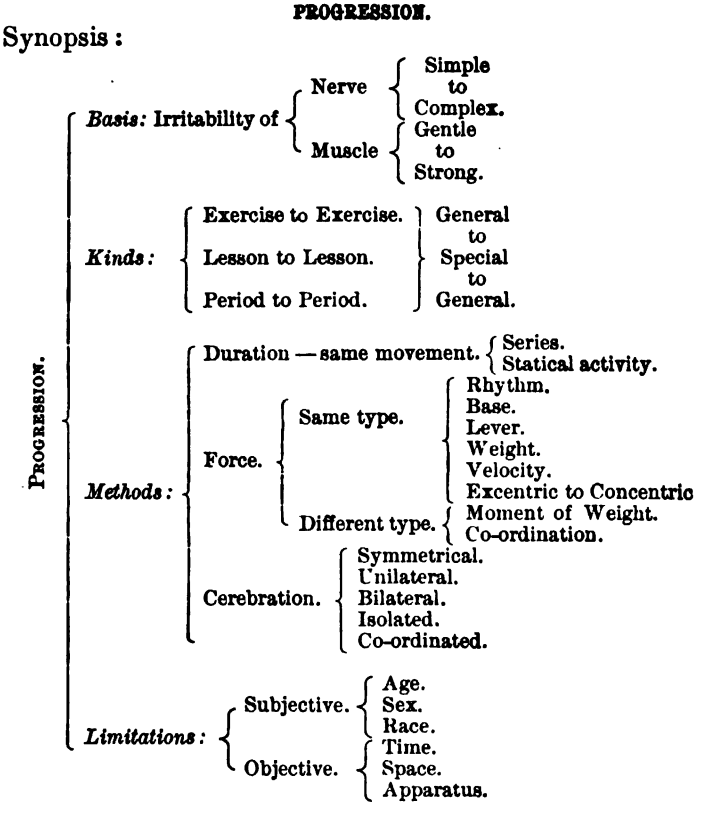
All exercises of doubtful effects are best left alone if good results are to be obtained. Likewise it is well to exclude movements that are unnecessarily unpleasing. Distinctly injurious exercises, as for instance those cramping or compressing the chest, movements causing the pupil to hold his breath, etc., should be carefully avoided.

The exercises used should not flavor too strongly of the circus, dancing-school, or barrack, but should contain some of the good characteristics of each.

Systems of gymnastics created by taking "the best from all" are to be shunned; first, because General Kinesiology recognizes no one system, unless it corresponds to the laws of gymnastics, and scientific gymnastics must always be the same the world over; second, because these so-called systems have all been gotten up by persons who know next to nothing about the systems whose best elements they claim to have extracted, and

certainly it is impossible to choose the *best* from that of which one knows scarcely anything.

Synopsis:



If gymnastics is to be systematic exercise, the movements must follow each other according to some distinct and sensible rule: there must be progression. Not only should the exercises within each day's lesson follow each other systematically, but from lesson to lesson (from week to week) the movements should progress from the very gentlest or simplest, step by step, to stronger or more complicated ones. It will be found that

the best effect of an exercise is never received, if it is taken too early, — it may then even prove injurious, — and hence no exercise should be applied until the previous ones of the same kind have been thoroughly practised.

Progression in all things runs from the general to the special, again to retrogress into the general; so, also, in gymnastics: the kindergarten movements are general as to effects, the exercises for the older child become more and more specialized, until physical culture shall have been acquired; then the gymnast turns into sports and athletics or other forms of general exercise. Moreover, every lesson in gymnastics begins and ends by general movements, and has specialized exercises placed between (as shown below).

Progression should occur from the simple to the complex proportionately as the irritability of brain and nerve increases, and from the gentle to the strong in the same degree as muscular power grows.

Experience has proved that if some particular order is followed in each day's lesson, the exercises can be made more powerful, more complicated, and more advanced, without danger of over-exertion or other injurious results. Practical investigation has shown that to attain this object the following order is the best: —

The Basis of Ling's System.

1. Introductory exercises.

General.
2. Arch-flexions.
3. Heaving-movements.
4. Balance-movements.

Special.
5. Shoulderblade-movements.
6. Abdominal exercises.
7. Lateral trunk-movements.

General.
8. Slow leg-movements.
9. Leaping.
10. Respiratory exercises.

Although the details of these movements will be explained in another part of the book, it may be well to give the following brief description, in order to indicate the scientific basis of the sequence.

(1) Introductions span the bridge from intellectual to physical activity. (2) Arch-flexions cultivate the possibility of respiration by stretching the chest. (3) Heaving-movements develop the power of respiration by exercising the inspiratory muscles. These two classes occur in the beginning of the lesson, since respiration may be said to constitute the basis of all exercise. (4) Balance-movements cultivate general equilibrium and diminish the heart-beat (equalize the blood-pressure) quickened by the preceding movements. (5) Shoulderblade-movements cultivate isolation and co-ordination in movements of shoulder-blades, trunk, and arms; they also correct the "student's stoop. (6) Abdominal exercises strengthen those muscles which support the viscera; improve digestion, etc. (7) Lateral trunk-movements quicken the circulation in the large vessels of the trunk and strengthen the waist-muscles. (8) Slow leg-movements diminish the blood-pressure and heart-beat, increased by preceding movements. (9) Leaping includes exercises of jumping and vaulting. These cultivate elasticity, speed, co-ordination, courage, and other important, general qualities of the body. (10) Respiratory exercises produce normal respiration (the leaping having put the pupil out of breath), and prepare the pupil for rest.

In this manner, within each lesson, one movement prepares the way for the next, and tends to counteract evil effects of the preceding. This sequence,[1] table, or "day's order," is *the* characteristic of Swedish gymnastics — its very kernel. Its

[1] It should be understood that this order can be varied to suit circumstances.

beauty is rapidly being recognized by American teachers, many of whom have already adopted it as the basis of their teaching, even though they may have disguised it by other names.

Many additions can be made to this table, as will be seen later.

Within each class of exercise a progression is made from lesson to lesson, week to week, or period to period, either so that the type of movement remains the same or so that it is changed.

With the same type progression is made as follows: —

1. Increasing the duration of the exercise.

a. By combining several motions into series; for instance: "Arms forward, sideways and backward stretch — one! Twó! One! Twó! One! Twó!" later becomes "Arms forward, sideways and backward — strétch!" etc.

b. By changing from oscillatory to statical action; *i.e.*, holding a position for a longer time before returning to commencing position.

c. By changing the rhythm; for instance: "Prepare to jump — óne! Two! Three! Four!" later becomes "The same — one-twó! Three! Four!" or "One! Two-threé! Four!" etc.

d. By decreasing the base. For instance, sideways flexion of the trunk, at first done with feet astride, is later done with feet together, one foot in advance of the other, etc.

e. By increasing the lever of the weight, as when in arch-flexions we successively use wing, yard, rest, and stretch position of the arms, the weight being the same (the body above the hips).

f. By increasing the weight or the muscular resistance. Examples of the former are the use of dumb-bells, chest-

weights, etc. In childhood Nature provides this progression through growth; and art needs to add no external weights, especially as the use of these involve a twofold progression, viz., increase of the weight and of its lever. Increase of muscular resistance can be accomplished in slow movements by bringing the "antagonists" into play (for inst., slow 2 A ext. upw. with elbows drawn well back).

g. By changing the velocity, making rapid movements slow, and slow movements rapid, in the first case producing "antagonistic resistance, in the last increasing the momentum of the weight (quick T. sidew. flex., etc.).

h. By changing from excentric to concentric activity. For instance yd. *d* stoop st. 2 A elev. is at first begun from Str. stoop st. pos.[1]

Besides, any exercise may serve as its own progression when repeated at a later period; for each time the pupil's ability must have grown, so that he can give the movement better form, and hence get greater effect from it. Perfection is seldom, if ever, reached.

No position should be used as commencing position of a movement, unless it has previously been practised as final position of some other movement.

When the type changes, progression occurs by increasing the moment of weight, the statics of the final positions being compared, as for instance when 2 Heel elev. is compared to cr. *a* ½ st. pos., etc. The details of this, as well as of the other laws of progression, however, have no place here, and will be dealt with in our forth-coming work on general kinesiology.

[1] Excentric activity = muscle makes effort of contraction but grows longer: — gives up to the weight.

Concentric activity = muscle contracts while shortening: — overcomes the weight.

Psychologically movements progress from symmetrical to unilateral, to bilateral; as for instance Str. pos. preceding ½ str. pos., and ½ str. yd. (½ str. reach, etc.) coming still later. Movements of isolation should come before those of co-ordination, since inhibition of impulses must precede association.

Besides, the rapidity and form of progression depend on the age, sex, and nationality of the pupil, so that generally for children progression by increasing the duration of movement is preferable, while for adults that of increasing the force is more suitable. The question of nationality is a psycho-physical one, and it will be found to necessitate many modifications of the various laws of progression.

Lack of space and apparatus will make progression uneven, and consequently retard it. The time allotted for the exercises also has a strong influence, since pupils having two hour-lessons a week naturally cannot accomplish as much as those who have daily lessons.

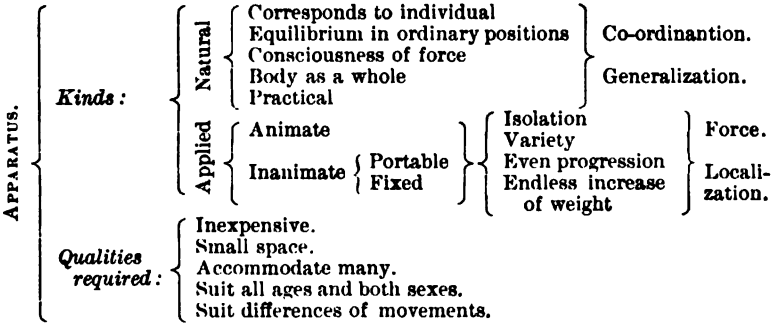
Progression should be made as rapid as possible, for the question is to accomplish the most in the shortest time. Yet never leave an exercise until the class can do it as well as their degrees of physical culture at the time will permit. Do not *hurry* for the sake of variety and at the expense of developing effect.

The tables of exercises, printed at the end of this book, should be understood as being only instances of tables. For progression differs with each class, even if the conditions remain tolerably the same; since it is the individuality of the pupil that will determine his advance, and, furthermore, no two teachers can teach in exactly the same manner.

APPARATUS.

The Swedish system of gymnastics contains free-standing exercises, and exercises on apparatus, yet it differs from other systems inasmuch as it is entirely independent of the apparatus, its movements usually being applicable to whatever may be at hand. This makes the system truly practical, as it is thus within reach of everybody, independent of wealth or other considerations. To reach good results by gymnastics, elaborate apparatus is not necessary; and, although we may be able to do more if we have apparatus of one kind or another, yet there are free-standing exercises that no apparatus in the world can ever substitute; and in gymnasium-work the free-standing movements should never be entirely omitted, but each lesson should contain at least as many of these as of the movements on apparatus.

Considering the body itself as a kind of apparatus, by the following schedule the free-standing exercises and apparatus work may be compared: —



The free exercises have the advantage that there is very little opportunity for over-work, since the weight lifted keeps proportionate to the individual himself. The movements are usually

done standing or in other common positions, and good equilibrium will result, while when exercising on a machine, the co-ordination of movement becomes in a measure dependent on the apparatus. See the sailor on land, or watch a skilled horseman walk, and you will be convinced of the truth of this. The free exercises also develop in the individual a consciousness of his body, of its strength, and of his ability to use it, which creates that knowledge of power which forms the basis of courage and a good bearing; this effect is not nearly as definite from apparatus work, for here the machine, not the self, forms the focus of attention. Furthermore, the free exercises are nearly all balance-movements, and as such bring into play the body as a whole, and the special part exercised becomes developed in its relation to that whole, while apparatus-movements tend to develop the part by itself without regard to its relation. If we remember that old saying that physical culture exists when "the body is a well-balanced whole under the perfect control of the will," the advantage of the free exercises becomes obvious. Besides, free exercises admit of gymnastics anywhere, at any time, independent of externalia, and hence are thoroughly practical.

On the other hand, the applied apparatus admits of more exactness of commencing position, more specialization of the exercise, or more isolation, — the pupil can be placed in a position where he will be obliged to stay. The exercises can also be given more variety; and as new and useful types can be added, progression can be made more even, and its limit be brought farther off; so, for instance, the progression by increasing the weight becomes limited only by the pupil's ability. While these advantages belong more especially to stationary apparatus, they are also in a measure found in portable or so-called calis-

thenic apparatus (Indian clubs, dumb-bells, and wands). If no apparatus at all is at hand, one pupil may form support or give resistance to another's movement. This, however, is suitable only for adults, and even for them such movements are only poor substitutes, since the person forming the support never can be as steady as the stationary apparatus would be: the movement becomes a transition from free to apparatus-exercise.

Speaking generally, the free exercises develop co-ordination and general physical culture, while the movements of applied apparatus cultivate force and localized effects. In order of progression, then, the free exercises precede the apparatus work, and the latter again gives way for other free exercises.

Admitting then that applied apparatus is useful, as it affords more possibilities, more variety, more recreation, there are certain qualities which we demand in good apparatus. 1. In the first place, it must be inexpensive, — a point that hardly needs argument. 2. In the next place, it should occupy but little room; for the floor of a gymnasium should be large enough to allow space for marching, running, free-standing movements, etc., and if the apparatus covers considerable surface, the room must be so much larger, it must have a separate "running-track," etc., all of which means additional expense. The apparatus used, if covering the floor-space, should be so constructed that it can be cleared away without a great loss of time; furthermore, apparatus made on these principles might be put into an ordinary room (schoolroom) without interfering with the use of that room for other purposes than gymnastics. This does away with the need of a gymnasium in schools that cannot afford one. 3. In order to be useful, the apparatus must also allow of a great variety of movements which are gymnastically unlike. So, for instance, a properly constructed horizontal bar can be

used in exercises belonging to any one of the classes enumerated on page 7, whereas the average horizontal bar used in America is useful for but little outside of heaving-movements. The rowing-machine, bicycle-machine, and other "modern" apparatus are instances of apparatus allowing of only one movement, besides being expensive and covering a great deal of floor space. 4. The apparatus should also be so constructed as to allow a great number to use it at the same time. For, considering how few minutes a day are usually allotted to gymnastics, it is of great importance to see that no one is wasting time by having to wait until there is room for him on the apparatus. Thus a horizontal bar should be so arranged that several can use it at once, so that those who stand waiting have just time enough for a short rest. 5. The apparatus, when fulfilling the four previous conditions, is also suitable for all differences of age, strength, and sex, so that we do not need one machine for boys, another for girls, a third one for men, etc., But no apparatus — no matter how well constructed — is used to its best advantage, unless there be a skilled hand to direct it; and it is equally true that a good teacher will be able to do a great deal with whatever apparatus there is at hand — no matter how poor it be. When a teacher complains that he cannot do anything; that he cannot keep the majority of his pupils interested, etc., "because he has not the necessary apparatus," it is safe to say that it is *his* fault, and not the fault of the apparatus, nor of the system which he professes to teach; he simply passes judgment on himself as being unqualified to teach.

Below is given a description of the apparatus used in Swedish gymnasia.[1]

[1] Such apparatus is now manufactured by the Narragansett Machine Co., Providence, R.I., according to approved models, and at prices less than those charged by local carpenters.

The Horizontal Bar (Fig. 1). — If properly constructed, this is the most useful of all the apparatus. Its dimensions are: length, twelve to eighteen feet; width, five to six inches; thickness, three to four inches. Its profile looks as in Fig. 1 *a*; the top is rounded so as to afford a good grip for the hands; the under side is grooved; this side is sometimes turned upward to allow of a different grasp or to better accommodate those who have small hands. The bar rests at each end on a bolt, stuck through a vertical beam in which the bar slides; this post (one at each end), about ten feet high, is usually fastened to the wall, but may also be fastened free on the floor by some contrivance so that it can be taken away if the space is needed.[1] There are holes made for the bolts at intervals of two inches. If the bar has to be made shorter or longer in order to fit the room, its other dimensions must be changed accordingly. The bar should, however, never be made too thick to afford an easy grasp, but its width

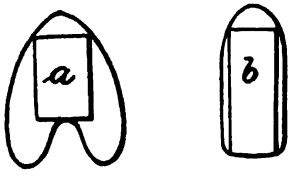


FIG. 1. — HORIZONTAL BAR.

may be changed to more than five or six inches so as to give sufficient strength. The bar is supplied with three or more wooden saddles (Fig. 2), which can be removed when not used. A bar twelve feet long will hold three of these saddles. A well-equipped gymnasium has a double set of bars to fit one above the other (double-bar) between the uprights; the other bar may have one plane side as shown in Fig. 1 *b*; the bar, put low with this side up, will then serve for balance-movements. The thick bar is called "boom" or vaulting-bar, the thin bar is called "heaving-board." The bars and saddles should be arranged so as not to rattle or shake when being used.

As compared to the thin, round bar, the Swedish type has many points

[1] The neatest construction is "Silow's bar," posts and bars being laid into the floor when not in use, and covered by a board, so as to leave the floor smooth.

of superiority. Its depth obliges the gymnast to use the muscles of his shoulders and chest more than those of his wrists when pulling himself up on bent arms; in that way this bar gives more chest-expansion than the other. In vaulting, the larger bar gives a firmer support, and hence is safer. Besides, this bar being stronger, it can be made long enough to allow several to use it at one time.

The Bar-Stalls[1] (Fig. 3) constitute the next most important apparatus. They consist of uprights three feet apart, about nine feet high, six inches wide, and two inches thick, and bars are fastened through them at intervals of four inches. The top bar springs out beyond the others, and the

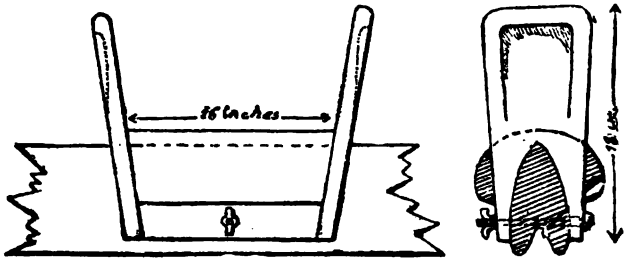


FIG. 2. — WOODEN SADDLES.

other bars are held in place by strips of wood screwed on to the front edges of the beams. The section of one of these bars is a rectangle one inch by two inches, with rounded corners. Wherever there is room, the walls may be lined with these bar-stalls. In front of the stalls are placed loose benches (Fig. 4), one foot high, the seats being nine feet long and one foot wide. There should be one bench to every three bar-stalls. The benches may be padded and covered with leather on the top. Lately bar-stalls are made so that three bars are left out about seven feet above the ground and a shelf is put in the space; then instead of long benches, there is a foot-stool for each bar-stall, and when not in use this stool is placed on the shelf just mentioned. If the walls cannot be used for attachment, bar-stalls may be run between posts as for the horizontal bar, and be balanced by weights, so that when not in use they can be pushed up out of the way. (The stalls are joined in sections of six or less.) This arrangement has the advantage that both sides can be used at once.

[1] Literally translated from the Swedish *ribb-stol*.

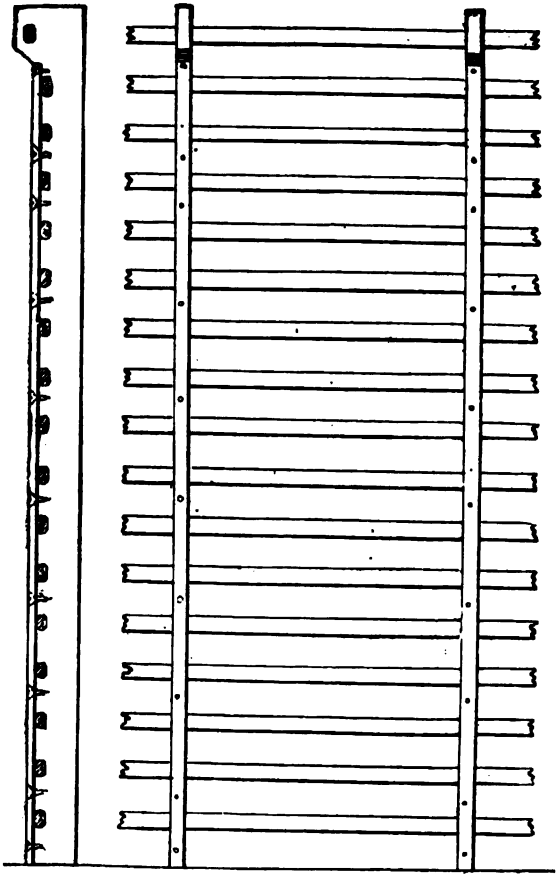


FIG. 3. — BAR-STALL.

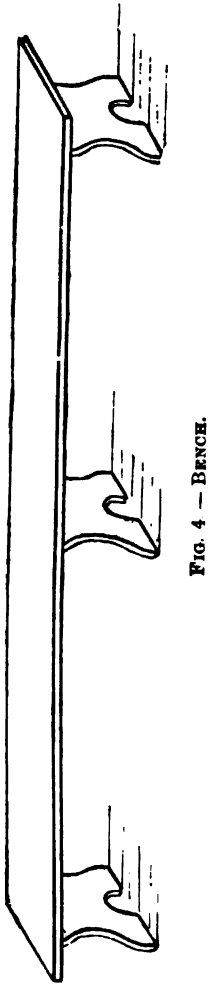


FIG. 4 — BENCH.

The Poles (Fig. 5 *a*) are round wooden spars with a diameter of two and a half inches. They are fastened to the ceiling by means of hooks, and they reach nearly to the floor. When not in use, their lower free ends should be tilted against the wall, and held there by means of a loop or other contrivance, so that they are out of the way. There may conveniently be one pole in front of each upright of the bar-stalls, which is suspended so as to hang about one foot and a half away from the beam when in use. Six or more poles should be found in a well-equipped gymnasium.

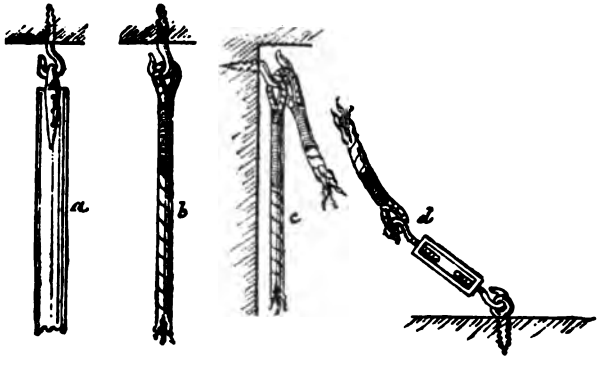
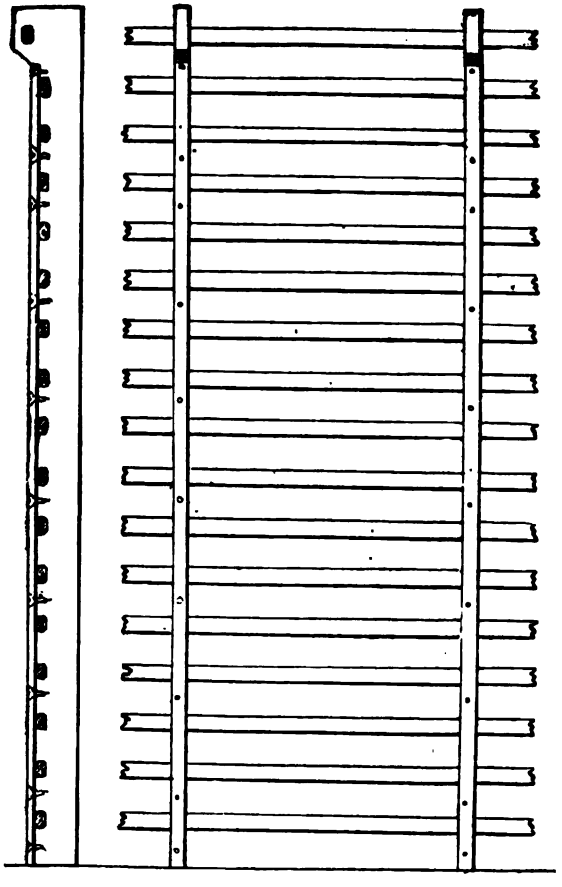


FIG. 5.

The Vertical Ropes (Fig. 5 *b*) are smooth (without knots), have a diameter of one and a half inches, are suspended from the ceiling, and come within a few inches of the floor; their lower ends are covered with leather. Six or more of these may be put in a row parallel with the horizontal bars, and a few feet away from them. The ropes, as well as the poles, should be at least one and a half feet apart; when not in use, they are gathered by a loop running through a pulley, and hoisted out of the way.

The Inclined Rope is fastened at one end by a hook in the wall close to the ceiling (or in the ceiling close to the wall); its other end is fastened to the floor near the opposite wall (or in the wall near the floor). This end is so arranged (Fig. 5 *d*) by means of turn-buckles or pulleys that the rope can be easily fastened and firmly stretched when in use; when



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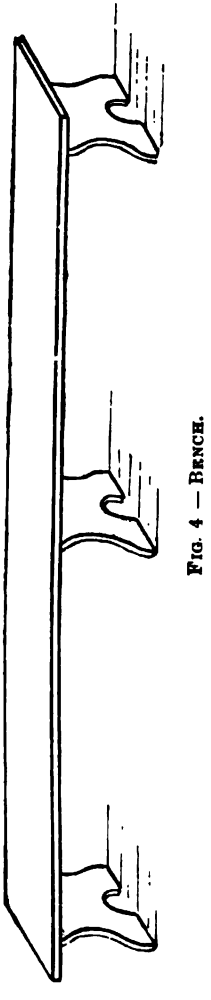

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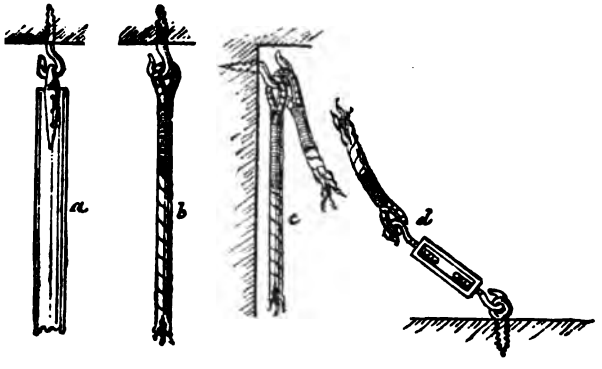

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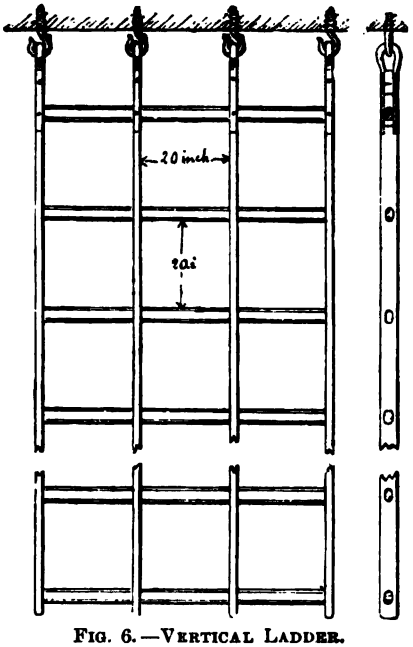


FIG. 6. — VERTICAL LADDER.

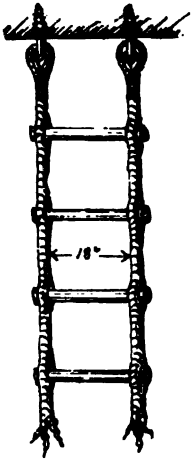


FIG. 8. — ROPE LADDER.

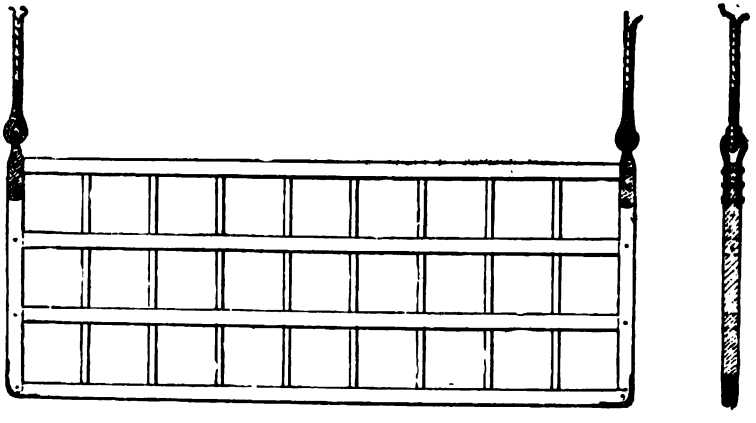


FIG. 7. — HORIZONTAL LADDER.

not in use, this end is unhooked, and the rope gathered to the wall on which its upper end is fastened. The rope should be so arranged that the incline is less than 45°; and the whole length of the rope should be from twenty-five to thirty feet. From the hook at the ceiling a vertical rope may be suspended so that no time is wasted by the pupils having to climb back the same way they came, but one rope serves as a "feeder" for the other. If space allows, there should be two or more inclined ropes in a gymnasium.

Wooden Ladders. — These are very useful pieces of apparatus, especially for children. They can be constructed in many different ways, one of which is shown in Fig. 6. This (the vertical) ladder is suspended

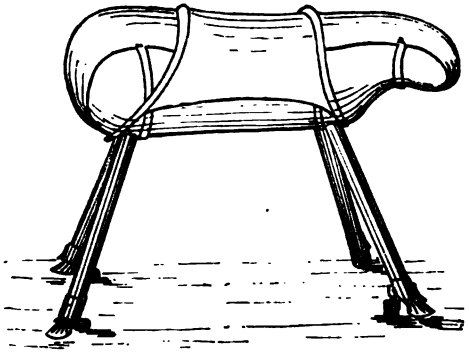


FIG. 9. — THE VAULTING-HORSE.

from the ceiling, and reaches to about two feet above the floor. The hooks from which it hangs are fastened to the ceiling at least two feet from the wall. The lower end of the ladder is allowed to swing free, or it is fastened to the wall by means of hooks and "screw-eyes," according to the purposes for which the ladder is used at the time. Another (the horizontal) ladder may be arranged so as to hang with the long side up (Fig. 7), its lower edge being about six feet from the floor. This ladder is best fastened by ropes and pulleys so that it can be raised or lowered. One ladder of each kind is enough in an ordinary gymnasium. If space allows, there may also be hung six or eight rope ladders (Fig. 8), whose lower ends swing free when the ladders are in use. At other times they are hoisted out of the way like the vertical ropes.

The Vaulting-Horse. — The modern horse has the appearance of Fig. 9. The body is about six feet long and one and a half to two feet broad over the hind-legs, and six to eight inches narrower over the front-legs. It is made of light wood strengthened by iron bands, and it is wholly covered by leather. Along the top is a long piece of roughly finished leather forming a blanket and a saddle with low pommels, held on by straps buckled under the body. The legs are round, made of gas-pipe and firmly fastened into the body, slanting outward so as to make the horse steady. They are supplied with casters so as to make it easily movable, and the legs are telescoping so that the horse may be made

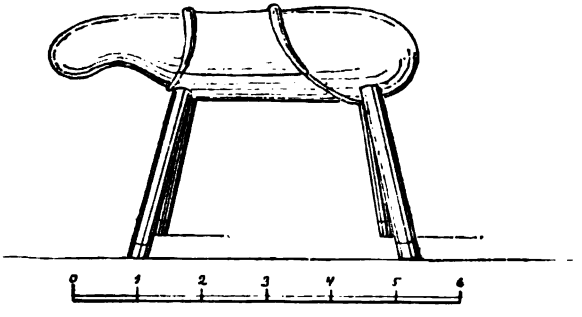


FIG. 10. — OLD-FASHIONED HORSE.

higher or lower. When the horse is to be moved, the legs are raised entirely above the floor. Although much more expensive than the old-fashioned horse (Fig. 10), it is far more practical than that one. However, the latter is a very good piece of apparatus, and will do almost as well for those who cannot afford the modern one.

The Vaulting-Box (Fig. 11). — This is a wooden box made in compartments. It has slanting sides and a top upholstered in leather. All the corners and edges are rounded. The top measures about one and a half by five feet, and the bottom three by five and a half feet; and with all the compartments, three or more in number, it stands five feet high or more. The compartments are supplied with handles or holes cut in the wood, so that they can be easily lifted off. This piece of apparatus is comparatively cheap, and will in a measure substitute the horse; besides,

it allows of certain movements (handsprings) which cannot be as safely done on the horse. A complete gymnasium has one horse and one or two of these boxes.

In a gymnasium there should also be found two or more loose ropes about one inch in diameter and about nine feet long. These are used for free jumping and for various other purposes; when used for jumping they are usually put into stands especially made for this purpose, as found in most gymnasia; but they may be fastened into the stall-bars or some other place quite as well.

The horizontal bar, especially if a double one with loose saddles, will form a substitute for any of the above enumerated

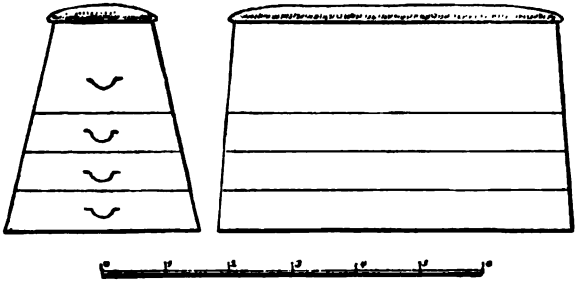


FIG. 11.—VAULTING-BOX.

apparatus; thus if you can afford only one piece of apparatus, this bar should be your choice. If you are called upon to apply the Swedish system in a gymnasium already fitted up, you will need no new apparatus, but can use whatever there is at hand; for *the exercises, and not the apparatus, make the system.*

(Of other apparatus the parallel bars are the most useful, as they allow of the greatest variety of exercises, numerous archflexions, heaving-movements, abdominal exercises, lateral trunk-movements and vaulting being possible. The wands are next in order of value. They permit of any "free-standing" exercise and many more besides. They add isola-

tion to the movements, and also give some new and useful types. Dumb-bells [1] and Indian clubs are useful chiefly in shoulder-blade movements, the former adding weight to the lever, the latter increasing the momentum of the pendulum. The chest weight, being a substitute for the resistive movements of medical gymnastics, is useful chiefly for individual development, but is not suitable for class-work, nor for persons who cannot well preserve a good commencing position while exercising.)

METHOD OF LEADING THE LESSONS.

A lesson in gymnastics may be conducted in one of many ways, of which the following are the most common : —

METHOD:				
Imitation	Teacher / Pupil	Music	Divided attention. / Mechanical rhythm.
Memorizing	What now ? / What next ?	or	
Commands	Concentration / Discipline	No Music	Concentration. / Natural rhythm.

Of old the teacher used to stand in front of the class and perform while the class imitated his movements. Usually it was only the teacher who executed the movements as they ought to be, and consequently he alone had the full benefit of the exercise. Moreover, in watching and imitating somebody, the attention will be focussed on him rather than on one's own movements, and consequently they will not be performed with the full volition required in gymnastic exercises. (If gymnastics are to connect mind and body, the mind certainly should not be occupied by something other than the movement; and besides, a diminution of volitional stimulus means a diminution in the bioplastic change resulting from the muscular contraction). Clearly, then, this method must not be used as a regular

[1] The (Indian) club is the oldest known implement for "military" gymnastics, and corresponds to the broadsword of to-day; next in the order of time comes the wand — lance and bayonet of to-day. Leaden dumb-bells were used by the Greeks for more speed in distance jumps, much the same as boys use them to-day for the same purpose.

thing. It has, however, its legitimate uses, as will be seen below.

Another method is for the pupil to learn a series of exercises, and go through them as best he remembers. Here the pupil usually pays more attention to the order to be followed — "What comes next?" — than to the movement he is doing at the time; and, his attention being divided, he will either forget the order of the series, or neglect the correct execution of the movements.

A similar thing occurs when a person hangs up a series of illustrations on the wall and goes through the movements, following the order of the figures: the attention given to the paper on the wall detracts just so much from the movements; and their effect will not be nearly as complete as when the sequence is determined by a will other than the gymnast's own, even though there is more effect than from pure memorizing. Movements are sometimes combined into series so as to tax the pupil's volition increasingly (see "Progression"), but this is done at long intervals; only with oft-repeated movements; and the series is never made longer than six to eight movements. Abuse of this method will lead to faulty posture and incorrect co-ordination; and besides the learning of long series, necessitating continuous repetition, is contrary to the laws of progression, which teach us that when the mechanics of a movement have been acquired, the movement should be dropped for the next one of the same class.

A lesson is best led by commands from the teacher, the class being arranged in ranks, military fashion. When apparatus has to be used this cannot be strictly carried out; but whether the exercises are free-standing or on apparatus, nothing should be done unless the teacher has ordered it.

Commands consist of two parts: one part, the *preparatory*, describing the exercise — it tells what should be done; the other, the *executory*, gives the time when it is to be done, and it also indicates the speed of motion. The preparatory part may sometimes be preceded by another, *cautionary* part, telling the pupils what to avoid — what not to do. This is often used to warn against common faults in gymnastic movements. For instance: "*Without moving the shoulders* (cautionary), *head backward* (preparatory) — *bend!* (executory)." The first two parts are pronounced with loud, distinct, and moderately slow voice, so that every one can fully understand what is to be done and be fully ready for it when the executory command is given. A short pause is made before the executory part; and now this is given with sharp, short accentuation if the movement is to be performed in rapid rhythm, and with a lingering intonation if the speed of motion is to be slow. For beginners the commands are longer and more descriptive; and the counts, "one, two, three, four," or "one, two; one, two," are used as executory parts. For instance, the command, "*Left foot sideways place and arms upward — strétch!*" when given to beginners would be: "*Left foot sideways place — óne!*" and after that has been done: "*Arms upward stretch — óne! Twó!*" and so on. For some apparatus-movements, the pupils take the commencing position at the command, "*Reády!*" after the position has first been described. The movement is then executed to commands as usual. The commands throughout this book are printed in Italics with quotation-marks, and an accent indicates whether the executory word is to be short or prolonged according to the desired speed of motion.

Commands enable the pupil to concentrate his attention

upon one thing at a time: *a* the getting ready for the movement; *b* its execution; the exercises become the result of undivided attention — full volition; and the pupil receives the full effect of the movements. The pause in the command is at first made to correspond to the reaction time of the movement, but is later lengthened or shortened so as to cultivate the pupil's ability of repose or speed, or in other words to increase his self-control. This psychological effect is absent in the methods previously described, and consequently these have less educational value. But they have also less recreative effects; for recreation for a brain-worker does not consist in fixing the attention on abstract things, but rather to concentrate it upon something concrete, something entirely different. It consists in letting one set of cells rest while a fresh set is working; and if the mind has dealt with things outside the body, recreation comes the most quickly if the mind is led back into the body, into the muscles. This presupposes that the pupil is "interested" in the exercises, or in other words that they require and occupy his whole attention.

Commands also teach discipline, since they require that the pupil should obey the teacher. For this reason this method has been said to be "tiresome for the pupils," "too much military style for ordinary citizens," "too pedantic," etc. But we wish to state that this is the least tiresome method of applying gymnastics. Moreover, discipline should be taught not only to military men but to everybody; for no one will have the same power of self-control unless some time in his life he has had to obey; and this discipline is by no means any encroachment upon the pupil's "rights as a free citizen of a free country." Only those who know what restriction means can truly appreciate liberty, and make a good use of it. This

discipline need not be pedantic, if the teacher knows how to let rest and activity, play and work, alternate. Frequent changes between these will make activity more earnest, rest more playful; and they will teach the pupils how to better distinguish between active and passive rest. In the education of children, we all know how a teacher without discipline is unable to impart knowledge to his pupils; and this is just as true with reference to gymnastics. Besides, children all like a good disciplinarian, who knows how to combine firmness with good humor and a kind disposition; they willingly obey, and he will accomplish more with them than any one else.

Every lesson in gymnastics should begin with the command, "*Attention!*" which word implies that the pupils should stand still (wherever they may be) in an active and careful posture, ready for work. When a rest is desirable, the command, "*Stand — at-ease!*" or "*In place — rest!*" indicates that the pupils may take a restful posture without leaving the ranks, or the place where they are standing at the time. To omit either of these commands, where they should be given, is to allow the pupils to become negligent. Whenever a new exercise is shown to the class, it is best to let them stand at ease; and, if they show signs of fatigue or lessened attention, command "*In place — rest!*" and let this be soon followed by "*Attention!*" In that way, whatever is done is done by your will and not by that of the pupils, — or at least they will think so! Under all circumstances, as long as the lesson lasts, the teacher should have absolute authority in the gymnasium, whether the class be at work or at rest.

Gymnastics may also be done to music; but at first the pupil's attention becomes absorbed by the music, which causes a loss of volition in the movement, and then the sound will be

the chief impulse for the movement, which becomes practically a mere reflex act. If, now, the teacher is performing at the same time the movements become still more reflex, and the pupil can, meanwhile, keep on reviewing his recitations or think of other abstract things: he is doing what he was doing before exercising, and besides is trying to exercise at the same time; and this has been called rest, "recreation"!

But there is another objection to music no less important. The rhythm of a gymnastic movement is definitely inherent in the movement itself; it differs from that of any other movement; it is natural, not artificial like the written rhythm of music. If music is played in mechanical rhythm it is spoiled: it ceases to be recreative; and if it is syncopated to correspond to gymnastic rhythms, it ceases to be music altogether — it is merely *sound* — and fails to have any advantage over the human voice.

There are some gymnastic exercises, like walking, running, club swinging, whose rhythm is like that of the pendulum, and these may be done to music without harm; club-*swinging* is done better to music than without it, for here it is the passive effects of extension which are the most important, while those of psychic influence are less so.

When the movement (like climbing, vaulting, etc., which are not done to commands anyway) so occupies the pupil's attention, that he is merely conscious of the presence of music without being able to distinguish its rhythm, then use it, and it will stimulate to better exertion by adding reflex impulse to the volitional; for now there is no danger of the movement being spoiled, but the pupil will climb higher, will vault in better form, etc. It is at those times that music is sometimes used in Swedish gymnastics.

In a discussion on this subject, a prominent educator said that gymnastics to words of command were not mechanical enough to be recreative, whereas gymnastics to music furnished this recreation, especially for those whose occupation is brain-work. To this we answer, that in order to reap all the benefits of recreation, you must put your mind into it; whereas, if you play in a mechanical way, while your mind is busy on something else, your recreation will do anything but give the required rest.

If a movement is to take place for the first time, and the teacher has reason to suppose that the command does not sufficiently describe it, then he may show the movement before commanding it. If he himself, for some reason, does not wish to perform before the class, he selects a skilled pupil to show the movement, and then proceeds to command it, after the pupil has taken his place in the class. The last arrangement is often the best, as the pupil is liable to get into a faulty posture, and the teacher then has the opportunity to correct it and thus show the class what to avoid. Whoever is showing a movement should take care *to face the same way as the class;* for left and right will otherwise easily be mixed by dull pupils.

When the movement is done, the class stands still in the new position, until something else is ordered. And now the teacher occupies the pause by moving about, correcting by word or action those who have a faulty posture. All these corrections should be made very quickly, so that the class is not kept in a tiresome posture for more than a brief period, or their attention will soon be lost. As a rule, the manual corrections — a pull or often the slightest touch is all that is necessary — will be found to be quickest in result and consequently the most practical;

and usually there is time to correct only two or three pupils. Repeat the movement if necessary, but do not keep the class standing in one position for any length of time.

Now, if the teacher were performing with the pupils, how could he make these corrections without temporarily interrupting the lesson? To keep the strict attention of the class, he would have to overlook the faults, and thus neglect half his duty; for a teacher's duty is not only to instruct what to do, but it is equally to correct and prevent that which should not be done.

The teacher should not execute the movement while giving a command, unless he has reason to suppose that the command will be misunderstood, for he will find it difficult to stop performing without causing the class to do likewise. Besides, under ordinary circumstances the command should suffice to produce the desired movement.

Make all commands as short as possible, and use as few as possible. Do not read them off like a sermon, but have some variety of tone, and try never to say the same command twice alike. A monotonous voice has a very soporific effect, and after a while but few of the pupils will put any volition into the movements. Do not use commands for the sake of hearing your own voice.

Vary the pause of the command so as never to allow the movements to become mechanical. In slow movements it is a good plan to give the preparatory command of the next movement before the first one has been fully completed, as this is a means of securing the best precision. Do not shorten the pause or abbreviate the commands so much as to cause the movements to occur in a slovenly manner or to become incomplete; but remember the words of Gust. Nyblœus, that "you

may take it for granted that careless gymnastics are no gymnastics, and that dull gymnastics are poor gymnastics."

Do not command "attention" unless the class is standing "at ease," for too frequent a use of this command will make both teacher and pupils forget its real meaning.

Try to use good English when teaching. If the command for a position is "bend," the corresponding command is "stretch." In a like manner use the words lift and sink, raise and lower, so that the opposites are used for opposite movements. Do not say "upward raise" and "downward sink," as raising is a movement upward, sinking a movement downward, etc. Another point to be observed is not to use very scientific terms when teaching children. Thus, do not say "Arm elevation, heel elevation and inhalation — one! Two!" but "Arms sideways lift, heels lift and breathe in — one! Sink and breathe out — two!" etc.

GYMNASTIC DRESS.

There is a common supposition that gymnastics require a special dress, and, on the other hand, a great many claim that you should wear the same dress when you exercise that you do in ordinary, every-day life. In gymnastics it is essential that the dress be loose so as to allow full freedom of motion; consequently collars and anything tight around the limbs should be removed. As for corsets, it is to be hoped that no one will be rash enough to practise gymnastics while embraced by this enemy of womanly health and beauty. The costume should be light in weight, so that the increase of bodily heat may not become excessive: however, it need not be any thinner than what should commonly be worn in-doors; for such a dress, especially in the winter, should always be light if we wish to

avoid taking colds. For school-children there will be no need of special gymnastic dress, when the exercises are practised in the schoolroom; for, in this case the movements are necessarily simple, and have none of the violent nature which would require a still looser dress for more freedom of motion, or a lighter one to prevent the great rise of temperature that is the usual result of violent and powerful gymnastic movements.

If the girls are dressed in a common-sense way, *i.e.*, in short skirts that do not drag heavily on the hips, with a blouse or other loose waist and without corsets, they will be able to partake of the gymnastic exercises in the schoolroom. If gymnastics is made compulsory in the schools, girls will have to dress accordingly, and perhaps in that way the much-talked-of "dress-reform" can be brought about. For the average girl, thus accustomed to perfect freedom of motion, would probably not be willing to give up this liberty for the sake of wearing the conventional stays, for which she would have no more use, since her muscles would then be developed to do the work for which nature has designed them, but which a mistaken idea of beauty has transferred to steels and whalebones.

As for boys they are always dressed for gymnastics; and if they remove their coats, and possibly their vests also, no other change need be made, not even in the gymnasium.

In a gymnasium, however, where more time is allowed for gymnastics, and where there are usually separate dressing-rooms, it is desirable that a regulation costume be worn, especially by grown women; for a woman's dress of to-day is thoroughly unfit to be used for gymnastic purposes, as it admits neither of free perspiration nor of any other freedom of motion.

The best gymnastic dress for women is the divided skirt with a blouse-waist all in one, gathered by an elastic at the waist (Fig. 12). The skirts are fastened above the knee, and fold over, reaching just below the knee.[1] One form of dress (Fig. 13) consists of knee-breeches, short skirt, and blouse-waist. This, however, is less practical than the other, besides giving a more awkward appearance. Those who object to wearing gymnastic dress may wear a very light skirt of usual length; but they will soon conform to the regulation dress on account of the greater freedom of motion which it allows.

FIG. 12. DIVIDED SKIRT, BLOUSE-WAIST.

FIG. 13. — OLD-FASHIONED GYMNASTIC DRESS FOR WOMEN.

The shoes should be light, the best kind — for men as well as for women — being low shoes with cloth tops, rubber soles, and low heels (or none at all).[2] The rubber sole has the advantage over the leather that it prevents slipping, and thus averts many an accident. Low shoes

[1] Somewhat shorter than shown in the figure.

[2] "The Posse Gymnasium shoe" can be had at Thayer, McNeil & Hodgkins', Boston.

are better than high ones, because they enforce a stronger activity of the ankles, and thus develop and strengthen them.

The best gymnastic dress for men consists of shoes as above, moderately wide trousers of flannel or duck, a loose shirt of the same material with turned-down collar, and a sailor's belt. The collar and tie should not be so large that they "float before the wind," as they will then be in the way. The whole dress should be white, with possibly a narrow ribbon around the collar and sleeve-linings. Fancy costumes belong to the circus, and are not becoming in a gymnasium. The low-necked and sleeveless shirt is hardly decent in any other place than one's own room when no one is present; besides, the naked neck and arms are liable to get chafed from the apparatus.

For ordinary gymnasium work it will be sufficient for a man to remove his collar, cuffs, coat, vest, and suspenders, and to change his boots, as this takes but little time. His gymnastic dress he may save for exhibitions, to give a more harmonious look to the class work.

PART II

MOVEMENTS OF THE SWEDISH SYSTEM OF GYMNASTICS

DEFINITIONS AND GENERAL THEORIES.

"THE oneness of the human organism, the harmony between mind and body," constitutes the fundamental principle of Ling's gymnastics. This harmony is preserved and developed in the healthy by gymnastic movements, aided by hygienic agencies, such as fresh air, food, drink, sleep, dress, etc.

A gymnastic movement is a movement defined as to space, time, force, and purpose. "Stretching a limb or making frictions along a muscle, nerve, or vessel, in a direction and manner and with a velocity and force all previously determined, and for a distinct purpose, are instances of gymnastic movements."

The limits of a movement are determined by the laws of gravitation and by the sphere of activity of the muscles. If the movement is not in conformity with the laws of the organism, it not only loses its value, but it may even prove injurious. Hence the anatomical structure and the physiological activity of the body, as related to motion, should be familiar to those who apply or superintend gymnastics.

A movement consists of a commencing position, a final position, and a chain of intermediate positions; and it is rendered

exact when these as well as the rhythm of action are clearly and severally determined. An accurate movement can be done only from a correct commencing position; and its final position, if correct, is a proof of exactness of performance. Hence, the class should be kept long enough in each position for the teacher to judge of the effect, and to make corrections accordingly. A point to be remembered is, that when a movement is *disfigured*, it generally does more harm than good; or, a movement has the best effect on the organism when it is performed in a graceful or beautiful manner; *i.e.*, "a correct position is the first condition for the utmost beauty and power of action, — for completeness and decision."

If we remember that every muscular effort is involuntarily preceded by an increased inhalation, and also that a contracting muscle absorbs about double the amount of oxygen that it does while at rest, we easily understand why free respiration is absolutely necessary in all exercise, and also why the greatest importance must be laid upon the development of the respiratory organs. If a position or a movement interferes with free respiration, it must be rejected. With reference to this point, Hj. Ling says that "every correct active movement, executed with undivided attention and intense will-power, is to be considered in a measure as a respiratory movement. This condition is expressed to every experienced eye by the way the head, neck, shoulders, chest, etc., are carried, and is lost by so slight a thing as a fall of the eyelids, etc. This is true of all positions and movements, from the simplest to the most complicated. . . . Hence all execution depends not only upon the quantity, but also upon the quality, even in jumping. . . . There is no greater mistake than to suppose that there could be any one active position deviating from this simple

rule. . . . Hence the necessity of making a distinct difference between standing, sitting, kneeling, passive positions, and the corresponding active ones: the former express rest or lack of attention, the latter activity and readiness for work." The little word "*Breathe!*" should be frequently used during a lesson in gymnastics, so as to make sure that no one is forgetting to comply with this important law of nature.

According to the point of view from which they are considered, movements may be classified in widely different ways. Psychologically, movements are: 1. Voluntary, — those that are the condition of meditated action. 2. Involuntary, — those over which the will has no control, such as the heart's action, the movements of the stomach and intestines, etc. Or, movements may be spoken of as simple and complicated (compound, complex), etc. All these classifications belong to the general kinesiology (science of movements), and hence need no mention here. Gymnastically, movements are active, passive, resistive, and assistive. The last three classes belong to medical gymnastics, and will not be described here, even though some of their forms may be borrowed and used in educational gymnastics. An active movement is a minutely determined, voluntary muscular movement. In gymnastics it must have a distinct gymnastic purpose, in contrast with other voluntary movements.

Physiology teaches us that every muscular movement should be considered as having three phases: 1. The nerve and muscle are getting ready to work, and yet there is no visible movement. 2. The muscle contracts. 3. The muscle relaxes, or returns to its former length ("medium position"). For this reason a movement begins and ends slowly and with but little force, whereas during the intermediate period the speed may

be increased, as the force grows. As a rule, it may be said that it is easier to do a movement quickly or with moderate speed, than it is to do the same movement slowly. In this way, one and the same movement repeated may serve as its own progression, simply if the speed of motion is changed. This, however, does not refer to *all* gymnastic movements, for there are movements which should always retain all their original speed in order to keep their gymnastic character and effect; and, at the same time, there are others which are to be executed slowly, even when first used. This will be better understood through the description of movements which follows.

Every movement should be repeated at least three consecutive times to each side before the class proceeds to another movement. To do a movement only once has but little effect. Do not give a movement too long duration, especially if it is powerful in its effects (like the arch-flexions, etc.). All movements should be executed in the simplest manner; stiffness, jerks, or unnecessary flourishes are foreign to rational gymnastics. Take the positions in the shortest way, and make as little "show" as possible. Remember that large, roundabout, and clumsy movements characterize those who lack physical culture.

Positions are primary and derived. The primary are five: lying, sitting, kneeling, standing, and hanging. The derived positions are simple and complex; the former being positions of the legs, arms, and trunk, the latter combinations of these.

For ease of description, a great many authors have classified movements, as head-movements, arm-movements, leg-movements, etc. In this book the exercises will be classified as on page 7,

with the difference that after the introductions will be placed leg-movements, which class will contain introductory leg-movements as well as balance-movements and slow leg-movements, as this arrangement will somewhat simplify the descriptions and thus save space.

Each movement will be supplied with its command. To abbreviate the latter, it will be written like the following example: "*Left (r.) foot forward place and arms upward — strétch! Trunk to the left (r.) — bend!*" this meaning that when the left foot is placed forward, the body should be bent to the left, whereas if the right foot is advanced, the body is bent to the right.

To shorten the nomenclature, a system of abbreviations has been used.[1] The capitals denote the various parts of the body; whereas small letters, or a capital followed by small letters, indicate the position and movement, etc. The nomenclature may at first seem odd, but the teacher will soon become familiar with it and find it a great help.

To save repetition in the descriptions, the exercises within each class are grouped together according to commencing positions, wherever this can be done. Thus the descriptions do not follow any progression. But in Part III. are given lists, in which the exercises are enumerated in progressive order, the lists merely giving their names. These progressive lists do not claim to be correct in every particular, but they may prove a valuable help to the teacher, when he has to make out his own tables of exercises.

[1] For complete list see Appendix.

INTRODUCTORY EXERCISES.

Synopsis:

INTRODUCTIONS.

- *Aim:* Preparation for { Lesson. / Exercise.
- *Kinds:*
  - True ——— { Order. / Rhythm.
  - Transitory { Regular. / Irregular.
- *Types:* { Head; base; respiration; / *Leg-movements*; lateral T. movements. / 2 A. ext.; prepare to jump.
- *Effects:*
  - Physical. { Equilibrium. / Save time (review). / Prepare for stronger movements.
  - Physiological. { Circulatory revulsion. / Intellectual to motor activity.
  - Psychological. { Connect origin of exercise with means. / Pave way for isolation and co-ordination.
- *Progression:* Depends on class from which they are borrowed.
- *Limitations.* { Quantity: few in short lesson. / Quality: easy in easy lesson.
- *Relations.* { Every exercise is an introduction to the next harder of same class.

Introductions are easy exercises used at the beginning of a lesson to make a transition from mental to physical work. Movements are introduced to correct the base and general equilibrium of the pupil and to establish a connection between his mind and his muscles, and between his mind and the teacher's. True introductions are exercises for order and rhythm, like formations, facings, march-steps, etc., which have no distinct gymnastic effect, but which form a part of that "drill" which produces the attention and discipline necessary before real work can begin. As introductions are also used, any exercises[1]

[1] Except abdominal, jumping and vaulting.

previously practised in their proper progression until their co-ordinations have been thoroughly acquired, but whose final positions are to be used as commencing positions for other movements, and which consequently may need to be reviewed. This will be found to save time which otherwise might be wasted in the correction of awkward pupils.

To change from intellectual to motor activity, the blood must be drawn to motor centres. The shortest way of doing this will be found in first drawing the blood from the head by increasing the supply somewhere else, and first *then* focussing attention upon muscular work, rather than producing this change abruptly. For this reason simple leg-movements requiring but little volition are always applied among introductions, whether there is time for anything else or not; for the activity of the leg-muscles increases the afflux to the legs, and since but little volition is involved in these movements (their co-ordination being simple or having been previously acquired), there will not be enough afflux to motor centres to annul this effect. Such leg-movements are placing the feet in the different wlk. st. positions (described under "Leg-movements"), facings, etc., as also balance movements whose co-ordinations have been acquired.

H. flex., H. rot., etc., are also used as introductions, even though they may be classified as heaving-movements, and when there is apparatus for the execution of the latter, the 2 A. exts. appear as introductions, so as to prepare for the strong tension to which the chest muscles are submitted in the true heaving-movements.

Lateral trunk-movements are often introduced here by way of review, and if time admits long lessons usually begin by respiratory exercises (for reasons given under "Respiratory Exercises").

The number and force of the introductions should be proportioned to the rest of the lesson, so that the latter is not made up chiefly of introductions, and so that these are not disappearingly few or easy. For it is to be remembered that the best execution, and hence the best effects of exercises, can occur only when these have been correctly prepared. On the other hand, the progression of introductions is largely that of the groups from which they are borrowed.

Speaking generally, any exercise is a transitory introduction to the next harder one of the same class; and each exercise is an introduction to those that follow in the same lesson.

Exercises which have a place among movements of distinct gymnastic effects, and which later are applied as introductions, are also spoken of as regular, transitory introductions. On the other hand, the teacher may subdivide the steps of progression into their elements as his classes may require; as, for instance, to do balance movements with support for a day or two before doing them free standing (Fig. 35), to execute facings in two counts, etc.; and such movements may be spoken of as irregular, transitory introductions. As a rule, these will not be described in this book, but they are left to the teacher's ingenuity.

Fundamental Position (Fig. 14). — The first thing to teach pupils is to take the fundamental standing position (fund. st. pos.). This corresponds to the position of the soldier, except that the feet are at right angles. Thus the position is as follows: heels together and on the same line; feet turned out equally, and making with each other an angle of 90°; knees straight, without being stiff; the body erect on the hips, which are drawn slightly backward; the chest well expanded; the shoulders drawn backward and downward so that they are level; the arms hanging down of their own weight close to

the body, with the hands extended, palms resting on the thighs "behind the seams of the trousers;" the head erect with the chin drawn in; the eyes looking straight forward, not downward; the weight of the body carried by the balls of the feet.

The angle of 90° gives a larger base than that of 60°, gives better equilibrium sideways, and has the advantage, gymnastically, of making it easier to find the direction "sideways forward," this now being in direction of the foot, which is pointed midway between sideways and forward.

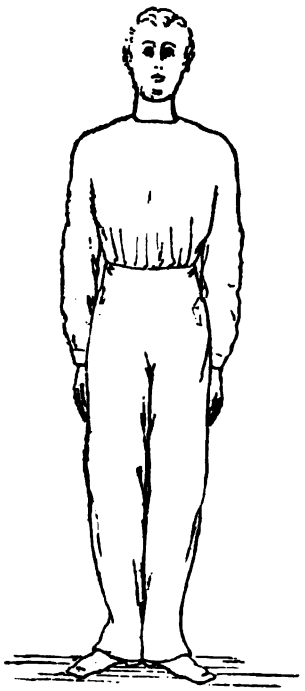


FIG. 14. — STANDING POSITION.

If a person be knock-kneed, or have very large calves, he will not be able to stand with his heels together, but may then be allowed to have them a little apart.

To make the pupils take this position, give the command, "*Atténtion!*" or, if they already are attentive, but standing in some other position, and you wish them quickly to take the fundamental position, the command is, "*Position!*" which means, "Take the fundamental position in the quickest possible manner."

When a rest is desirable, command, "*In place — rést!*" which allows the pupils to take easy positions, and to talk, provided one heel is always kept in place. If you wish them to stand in easy positions without talking, command, "*Stand — at ease!*"

How to Arrange the Class. — Before the lesson (in a gymnasium) begins, at the command, "*Form ranks!*" the class forms in two ranks, one behind the other. Arrange the class so that the tallest one stands as first man on the extreme right (right wing) in the first (front) rank, the next one in size behind him as first man of the second (rear) rank; the next two tallest are placed in the same way on the left wing (the extreme left); and this way you arrange the whole class so that the smallest ones stand in the middle of each rank. If the class consists of an odd number of pupils, an empty space is left in the second (rear) rank next to its last man on the left wing.

To get the ranks in a straight line, and to correct distances, command, "*Right — drés!*" All except the first man on the right wing of the first rank turn their heads quickly to the right, and move by little steps so that they are all in a line, the men of the second rank standing behind those of the first and one step back. At the command, "*Frónt!*" the heads are again turned quickly forward. The men of the first rank should stand so far apart that, if each one slightly raises his right arm with the elbow a little bent, it touches the left arm of the next man on his right; this adjustment of distances takes place while the "right — dress" is being executed.

If it is desirable to have the pupils at a greater distance from each other, command, "*Whole distance, right — drés!*" when all the pupils except the first man on the right wing of each rank march to the left flank; each one halts as soon as he is so far away that he can just touch the left shoulder of the pupil on his right side with the fingers of his outstretched right arm. The pupils keep their right arms lifted and their heads turned to the right, until the teacher commands, "*Frónt!*" If a still greater distance is desired, the teacher commands, "*Double*

distance, right — drĕss!" This is done on the same principles, except that the pupils stretch both arms sideways, and halt so far apart that their fingers touch.

Open Orders. — The ranks are opened at the command, "*Open ranks — márch!*" The second rank takes two steps backward, beginning with the left foot, and halts (count "*One, two, three!*" if you so wish), taking care to form an even line.

To open orders, command first, "*Count — twos!*" Within each rank the first man on the right says "*One,*" while he turns his head to the left; upon hearing this the second one turns his head to the left and says "*Two,*" the third one says "*One,*" the fourth one says "*Two,*" and so on all through the rank. If the ranks are closed, only the first rank counts, the men of the second rank taking the same numbers as those who stand in front of them. The next command is, "*Numbers two (one), one step backward — márch!*" The designated numbers take one step backward with the left foot, and bring the right foot down beside the left one. For a little practice, you may now command, "*Numbers one and two, change ranks — márch!*" The twos take one step forward, the ones one step backward, etc.

To close orders, command, "*Numbers two (one), one step forward — márch!*" and then, "*Close ranks — márch!*" The second rank now takes two steps forward, beginning with the left foot, and halts. For advanced classes, the shortest command is, "*Close orders — márch!*" when numbers two (one) step forward into their places in the respective ranks, and the ranks then close as before.

Another and favorite arrangement is to count threes instead of twos, and, after having opened ranks, to make numbers one take one step forward and numbers three one step backward. This arrangement affords the teacher the best survey of the class.

If the class is facing the flank, at the command, "*Open ranks — márch!*" each rank takes one step to its respective side, so that the ranks separate. To open orders, command, "*Numbers two, one step to the right (l.) — márch!*" or, "*Numbers one, one step to the right (l.), numbers three, one step to the left (r.) — márch!*" etc.

If space does not admit of the whole class in one division, it may be formed in two divisions, one behind the other, and six steps away from its second rank. The commands will then be the same as above. If there are less than twelve pupils in a class, they are best arranged in one rank.[1]

Facings. — To face to the flank, command, "*Right (l.) — fáce!*" The pupil turns on his right (l.) heel 90° to the right (l.), and supports the motion by the ball of his left (r.) foot; when this is done, he places his left (r.) foot beside the right (l.) one in fundamental position. Facing to the right is done on the right heel, facing to the left on the left. This conforms with the infantry tactics published since this book first appeared. Half-facing is executed on the same principles, to the command, "*Right (l.) oblique — fáce!*"

To face the rear, command, "*About — fáce!*" On the left heel turn 180° to the left, supporting the motion by the ball of the right foot. When the semicircle is completed, the right foot is placed beside the left one in fundamental position. (The old-time facing to the rear used to be a most complicated affair.) The Swedish way of turning always to the left is intended to make us as well balanced on the left as we naturally are on the right; besides, the motion is executed on exactly the same principles as right and left face, which greatly simplifies

[1] To conform to the room, a class may sometimes be arranged in 3 (or 5) ranks. To open, middle rank stands still, outside ones step out one (two) step(s).

matters. Not to make the body one-sided, however, occasionally practise "about — face" to the right, the command being, "*Right about — fáce!*" The motion is then executed on the right heel, and supported by the ball of the left foot. An occasional "right about — face" is a good means of wakening a sleepy class, or of refreshing the attention a little.

For beginners execute the facings to two counts: "*óne!*" — the turn on ball and heel; "*two!*" — the backward foot is placed beside the forward one.

In all facings the arms should be kept close to the body and the shoulders level.

During a lesson in gymnastics the class should usually be facing the flank.

Marching. — Although marching does not strictly belong here, we will, however, describe it in connection with the above movements, since it forms parts of the standard "drill." To start the class, command, "*Class, forward — márch!*" when every pupil immediately begins marching by bringing the left foot forward first, the right one following with a speed of a hundred and fourteen to a hundred and sixteen steps a minute; the length of each step should (for adults) be about two feet and a half. In marching, the chest should be carried well forward and the head erect. The shoulders should be kept level, and to prevent them from swinging forward and backward, the arms should oscillate in even rhythm with the legs by a slight flexion and extension of the forearm, the limbs of opposite sides moving simultaneously. As the foot touches the ground, knee and instep should be extended so that the ball of the foot and the heel touch the ground simultaneously. If the heel strikes first, the step loses its elasticity.

To increase the length of the steps, command, "*Long steps*

— *márch!*" when the steps are increased to about three feet. To regain the ordinary length, command, "*Ordinary — márch!*" when the steps are again shortened. To shorten the steps to about a foot and a half, command, "*Short steps — márch!*" and again, "*Ordinary — márch!*" The short steps should be a little more marked than ordinary marching. If you wish to keep the class marching in the place where they stand, command, "*In place — márch!*" (or, "*Mark time — márch!*"), when the pupils slightly lift their feet. "and make a semblance of marching, without gaining ground." If from that you wish to get ordinary march, command, "*Forward — márch!*"

Marching backward is done to the command, "*Backward — márch!*" and resembles "forward — march," except that the steps are only half as long.

If you wish the class to change step, command, "*Change steps — márch!*" The foot that is behind is placed beside the front one, instead of passing it, and the latter takes a new step forward. A continuous change of step ("*With change of steps, class forward — márch!*"), a movement somewhat resembling polka, is an excellent means of quieting down the rhythm of marching, if it has grown too rapid. Besides, this form of semi-dance is excellent for developing a graceful and light step. Care, however, should be taken that the step does not become too elastic, as is often apt to be the case. On the other hand, the short step usually quickens the rhythm.

If the class does not keep time, command, "*Mark every three (five) steps — márch!*" At every third step the foot is put down with an increased pressure, knee and instep being stretched as usual. The pupils should not be allowed to slam the foot down with bent knee, trying to make all possible noise. Always make the marking occur on odd steps, so that it will be done by each foot alternately.

Running takes place at the command, "*Double quick — márch!*" when the whole class simultaneously come forward with a speed of about a hundred and sixty-five steps a minute. In running, the body should be gently inclined forward, the head thrown back, and the mouth closed. The forearms should be lifted to horizontal position, with firmly closed hands, the elbows well backward and close to the body. The forearm is moved in a straight line slightly forward and backward in rhythm with the legs. The steadier this motion is, the easier it is to breathe naturally and deeply. A distinguished Swedish writer has described walking as being "a constant falling forward, where the weight of the body is received by each leg alternately;" and this is still more true of running. If you once know how to run with the least expenditure of energy, this form of motion is no more fatiguing than walking, for short distances at least.

Running becomes more elastic and less exhausting if done on tip-toe. Command, "*On tip-toe — márch!*" . . . "*Double quick — márch!*" To regain ordinary march from running, command, "*Common time — márch!*"

To Halt. — If the class is marching, and you wish them to stop, command, "*Class — hált!*" The class take one more step, and bring the backward foot down beside the other one (thus you count, "one, two"). If the marching is done on tip-toe, the halt is done on tip-toe, and the heels are then lowered (count, "one, two, three"). If halt is commanded from double-quick, the class take three more steps, and halt (count, "one . . . four," and "five" if on tip-toe).

For other forms of marching, see the "Standard Infantry Tactics."

"Fancy steps" have been so well described by other writers that they will not be mentioned here.

Whereas tip-toe marching is to be classified as a balance-movement, ordinary marching has more the characteristics of slow leg-movements, and running has effects in common with jumping and vaulting. Running should always be followed by ordinary marching. Marching and running are usually put in somewhere in the middle of the table of exercises, and they should form part of every lesson in gymnastics. That they are necessary, no one will deny; for, as the Swedish proverb says, "As we stand and walk, so shall we act."

Close St. Pos. — Command, "*Feet — clóse!*" The balls of the feet are lifted from the ground, and, rotating on the heels, the feet are brought quickly together, so that their insides touch, when they are again placed wholly on the floor. To resume fundamental position, command, "*Feet — ópen!*" The feet are turned out on the same principles as above. During the whole movement the body should still gravitate forward, as in fundamental position, and be as immovable as possible. This movement is used to correct the base — whenever you see that some pupils are standing with the feet unevenly turned out. If the movement does not immediately produce the desired effect, it should be repeated twice or more. In such a case, command, "*Feet close and open — óne! Twó!*" or, "*The same — óne! Twó!*" The close st. pos. is used as commencing position for various exercises.

Wing Pos. (Fig. 15). — In many movements it is desirable to fix the arms so as to gain better muscular isolation. This is done either by resting the hands on the hips or locking them together behind the back. The former position is called wing pos. (wg. st., wg. sitt., etc.), on account of the arms resembling the wings of a bird. The command is, "*Hips — fírm!*" The hands are quickly lifted, and grasp the waist firmly just above

the hips. The fingers are held together in front and the thumbs are behind; the palms of the hands rest fully on the hips, and the elbows are slightly drawn backward. In this position the trunk is better isolated from the abdomen and legs, so that movements of parts on either side of the waist are more easily confined to prescribed parts alone. Besides, the respiratory muscles get a firmer support, respiration thus becoming freer. A common fault is to draw the elbows too much backward.[1]

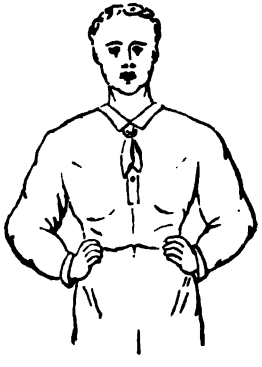


FIG. 15. — WING ST. POS.

FIG. 16. — REST ST. POS.

Rest Pos. (Fig. 16), so called on account of its restful feeling. Command, "*Neck — firm!*" The hands are quickly lifted, and grasp the neck below the occiput, with fingers locked together, elbows carried well backward, and head remaining erect. A common fault is that of bringing the elbows forward, thus pushing the head forward and compressing the chest. To prevent this it is allowable to let the fingers touch (by the tips) instead of locking them. In this position, the upper arms being lifted, the chest is much more expanded than in st. or wing st. positions; and the axillary artery being extended, the

[1] For further discussion, see Appendix.

blood flows more easily to the arm. In many movements the rest st. pos. is more powerful than the wing st. one, the lever of the weight (the trunk + the raised arms) being longer. The position should not be used until (by shoulder-blade movements) the pectoral muscles have been rendered extensible enough to prevent a too faulty posture.

The following head-movements are, strictly speaking, heaving-movements, and their effects will be described under that heading; but since they are *always used as introductions*, it may be as well to describe their mechanics here.

St. H. Backw. Flex. (Fig. 17). — Command, "*Head backward — bend!*" The head is bent slowly backward without changing the posture of the rest of the body. At the command, "*Upward — stretch!*" the head is slowly raised, the chin being first drawn in. When done for the first time, it is safest to make the pupils take wing pos., before doing the movement. Whenever the class have "hanging" heads, you order this movement two or three times in order to correct the posture. This is especially necessary after exercises which are likely to push the head forward.[1]

FIG. 17.—H. FLEX. BACKW. AND FORW.

St. H. Forw. Flex. (Fig. 17). — After some practice the head may also be bent forward at the command, "*Head forward — bend!*" "*Upward — stretch!*" The head is tipped forward, with the chin drawn in, as far as good posture will allow. This movement should be immediately followed by head flexion backward.

St. H. Sidew. Flex. (Fig. 18). — Command, "*Head to the left (r.) — bend!*" "*Upward — stretch!*" The movement, prac-

[1] For further discussion, see Appendix.

tised alternately to each side, should be ended by a head flexion backward, for the reason that during sidew. flex. the head glides somewhat downward.

St. H. Rot. (Fig. 19.) — The head is rotated to either side at the command, "*Head to the left (r.) — turn!*" "*Head forward — turn!*" The head must not be turned so far that the shoulders are out of line. When done for its effect of poising the head, the movement is executed slowly. It can also be

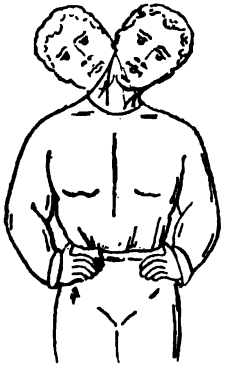


FIG. 18. — H. FLEX. SIDEW.

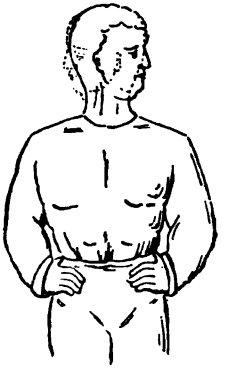


FIG. 19. — WG. ST. H. ROT.

done with utmost speed at the command, "*Head rotation to the left (r.), right (l.), and forward — óne! Twó! Thrée!*" . . . In this form it is used (*a*) to keep the pupils busy in a position which we wish them to hold for some time, so as to get the utmost effect out of it; (*b*) to make equilibrium in balance-movements more difficult. When done slowly, the movement is suitably followed by head flexion backward, as the head involuntarily glides slightly forward when being turned to the side.

St. H. Rot. w. Flex. — Command, "*Head to the left (r.) — turn! (In this position) Head forward — bend! Head back-*

ward — bend! Upward — stretch!" . . . The head is bent obliquely in direction of the face and occiput.

All these movements tend to improve the posture of the head and chest by strengthening the muscles of the neck. (See "Heaving-movements.")

LEG-MOVEMENTS.

FOR convenience of description in this book, introductory leg-movements, balance-movements, and slow leg-movements have been brought together under the common heading leg-movements.

Synopses:

a.

BALANCE-MOVEMENTS.

- *Aim:* To cultivate equilibrium in ordinary positions. / To correct general posture.
- *Contents:* Movements of standing and walking.
- *Types:* St. / ½ st. / Fall out st.
- *Effects:*
  - Physical. — Develop extensors of body. / Lessen blood pressure.
  - Physiological. — Improve respiration. / Improve metabolism. / Improve cerebration.
  - Psychological. — Localization of cerebral effort. / Automatism of co-ordination. / Consciousness of power. / Repose.
- *Progression:* 2 Heel elev. / 2 Kn. flex. / L. elev.
- *Limitations:* Quality: to correspond to mental ability. / Quantity: to correspond to needs of pupil.
- *Relations:*
  1. Follow heaving-movements.
  2. Improve all free exercises.
  3. Become introductions, and slow leg-movts.
  4. Much needed by children. Less needed by adults.

b.

Slow Leg-Movements.

- ***Aim:*** Diminish arterial pressure. / Equalize circulation.
- ***Contents:*** Movements increasing capacity of vessels of l
- ***Types:*** Kn. flex. / T. forw. flex.
- ***Effects:***
  - **Physical.** Decrease quantity of blood in chest. / Increase *vis-à-fronte* in veins. / Decrease heart-beat. / Lessen cerebral pressure.
  - **Physiological.** Ease respiration. / Remove fatigue.
  - **Psychological.** Mental revulsion, even to cessation of attention.
- ***Progression:*** Depends on class from which they are borrowed.
- ***Limitations:*** Used when preceding exercises are strong, otherwise not.
- ***Relations:*** 1. Derived from balance-movements. / 2. Follow after any movement when needed.

a. Balance-movements are exercises of equilibrium requiring high co-ordination and comparatively little force. Bringing into play those muscles which hold the body erect in standing pos., these will develop, until by continuous practice they mechanically produce a good posture of the body in the ordinary positions of every-day life.

They are introduced immediately after the heaving-movements, so that after these (and the arch flexions) have caused an improved respiration, the next most important effect of exercise, a good posture, should be secured before specialized movements are applied. They have been placed in that part of the lesson also, because increasing the afflux to the legs, they will have a slight effect of diminishing the heart-beat, which may have been immoderately increased by the heaving-movement.

(If a definite effect of this kind is desired, however, a slow leg-movement is introduced before the balance-movement.)[1]

The extensors of the spine being brought forcibly into play, the chest expands, and consequently some degree of thoracic aspiration is produced by the movement. Repeated practice will produce a better carriage of the chest, and this will cause an improved functional activity of the organs both in the chest and in the abdomen. And since the chief requisite in the movement is co-ordination, an increased cerebration (with increased cerebral afflux) will ensue, especially in the cerebellum.

The general power of co-ordination, habitual, automatic, and reflex, also grows with the continued practice of balance-movements.

The concept of the movement must be exact, as also the motor association for its expression, in order that the execution should be correct, and in due time this will lead to a better ability of correctly localizing the cerebral effort, and of confining it to the correct pathways. At first this development is local, but soon takes the form of a general quality of the mind, and the general power of inhibition grows. In this manner the foundation of (active) repose[2] is laid, since repose consists in the ability of inhibiting impulses, while keeping others concentrated for action in chosen pathways.

As the ability of execution increases, through the muscular sense the pupil becomes conscious not only of his inherent power, but also of his control of it, and this creates in him that sense of independence of externalia which forms the basis of all true manhood: the consciousness of self, which takes away

[1] For further discussion, see Appendix.

[2] Passive repose has no place in gymnastics for the well.

self-consciousness, and which appears but slowly from apparatus-work, and from other kinds of free exercise.

A description of the progression of this class of exercises, as of all others, is a mere application of the laws of general kinesiology, and has no place here; suffice it to say, that the quality of the movements should correspond to the individual's ability of co-ordination, so that cerebral energy may not become wasted, and that in each lesson as many balance-movements may be introduced as circumstances require, more than one being very desirable.

On account of their psychological effects, these movements are more needed by children than by adults; and while for the former the progression takes the form of quality (increase of co-ordination), for the latter it takes that of quantity.

If good attention is given to these movements, they will improve the form of all free-standing exercises, since these are in a measure balance-movements.

A balance-movement, whose automatism has been acquired, ceases to be a balance-movement for that class or individual, and is thereafter used as an introductory exercise or as a slow leg-movement.

b. Slow leg-movements are exercises producing passive extension of muscles of the leg. It having been proved (Prof. Lovén and others) that moderately stretched veins retain the same diameters, it follows that the extension of leg-muscles will cause an increased circulation through the legs, secondarily diminishing the pressure in the arteries and lessening the total quantity in the body above the waist; so that these movements will cause a diminution of the heart-beat and equalize the circulation, if the blood has been previously congested into other parts. For that reason these movements are used *whenever*

preceding exercises have produced circulatory disturbances in excess of the normal recuperative powers of the body; and for advanced classes a movement of this nature is usually needed somewhere toward the end of the lesson, best as an introduction to the second heaving-movement or to the jumping and vaulting. It should be understood, however, that slow leg-movements are to be used only when they are needed, and that as such they may appear in any part of the lesson besides in the regulation place. In gymnastics for school children they certainly can be entirely eliminated.

The increased venous circulation will tend to ease respiration, if it has become labored after such exercises as heaving-movements; and, there being a more rapid return current, and consequent removal of waste matter, the slow leg-movement in a measure acts like a preventive and cure of fatigue.

The accumulation of blood in the legs will diminish the supply given to the brain, and this will at first change the state of the mind, and, if continued, will lead to loss of consciousness for want of blood-supply.[1]

The progression of these movements follows that of the classes from which they are borrowed, and needs no special consideration, since the movements are used for temporary functional correction, and not for physical development.

When the slow leg-movement is left out of the lesson, it may conveniently be substituted by a balance-movement.[2]

c. True introductory leg-movements are such as taking the different wlk. st. pos.; all others are borrowed from the balance-movements in accordance with what has been said about "Introductions."

[1] These movements are used extensively as a cure for insomnia caused by cerebral hyperæmia, or too active a mind.

[2] For further discussion, see Appendix.

In many movements the nomenclature is simplified by merely naming the terminating position. When this is given, it naturally follows that the movement consists in taking this position, first to one side, then to the other.

Walk *a* St. Pos. (Fig. 20). — Command, "(*Hips — firm!*) *Left* (*r.*) *foot sideways forward — plâce!*" The foot is lifted and moved twice its own length in its own direction, and placed on the ground with a gentle pressure, the weight of the body being carried equally by both legs. "*Change feet — óne! Twó!*" At "*one*" the foot is moved back into fundamental pos.; at "*two*" the other foot is moved in its own direction as above. Fundamental pos. is resumed at the command, "*Posi-*

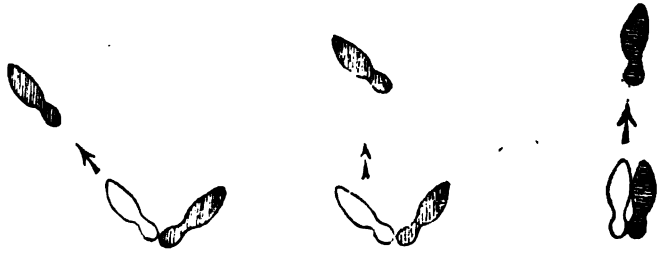


FIG. 20.—WALK *a* ST. POS. FIG. 21.—WALK *b* ST. POS. FIG. 22.—WALK *c* ST. POS.

tion!" The foot may be moved sideways backward on the same principles. (The position may then be named "Walk *a* st. pos. backw.")

Walk *b* St. Pos. (Fig. 21). — Command, "(*Hips — firm!*) *Left* (*r.*) *foot forward* (*backw.*) *— plâce!*" The foot is lifted and moved parallel with itself twice its own length forward, and placed on the ground with a gentle pressure, the body being carried equally by both legs. "*Change feet — óne! Twó!*" on the same principles as above. The movement is done backward as well.

Walk *c* St. Pos. (Fig. 22).—Command, "*(Hips—firm!) Feet clóse! Left (r.) foot forward (backw.) — pláce!*" The foot is moved twice its own length in its own direction. Care is taken to keep the feet pointing straight forward. "*Change feet—óne, twó!*" etc.

Stride St. Pos.[1] (Fig. 23).—Command, "*Left (r.) foot sideways — pláce!*" The foot is moved parallel with itself, twice its own length to its own side, and placed on the ground, so that the heels are still on the same line, parallel with a line through the shoulders; the feet are equally turned out, the knees straight, and the body carried equally by both legs.

FIG. 23.—STRIDE ST. POS.

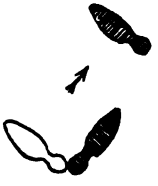


FIG. 24.—CROSSWISE ST. POS.

For beginners the movement is best given the following form: Command, "*Feet sideways place — óne! Twó!*" At "*one*" the left foot is moved its own length to the left; at "*two*" the right foot is moved its own length to the right. The fault of carrying the weight principally on one leg, which easily arises when only one foot is moved, is by this means prevented. When the movement has been done this way, the pupils take fundamental position at the command, "*Position — óne! Twó!*" the movement beginning by the left foot being moved its own length to the right. When the right foot is placed beside the

[1] Abbrev.: std. st.

left one, the arms take fundamental position (if they were in any other position before).

Crosswise St. Pos.[1] (Fig. 24). — Command, "*Left* (*r.*) *foot crosswise forward* (*backw.*) — *pláce!*" The foot is moved parallel with itself in direction of the other foot, and placed on the ground, the distance between the heels being a little less than twice the length of the foot. Care should be taken to keep the shoulders facing as before the foot moved. The body is carried equally by both legs. "*Change feet — óne! Twó!*"

After some practice each of the above movements can be done in a series of four counts. Command, for instance, "*Foot-placing sideways forward in four counts beginning with the left* (*r.*) *foot — óne! . . . Fóur! The same, beginning with the right* (*l.*) *foot — óne! . . . Fóur!*" Practised in this way, these introductions improve the conception of time as well as that of space.[2] Later on these positions are used as commencing positions for various exercises.

Fallout *a* Pos. (Fig. 25). — Command, "*Left* (*r.*) *foot sideways forward — fall ́out!*" The body is allowed to fall in direction of the left (r.) foot, which is lifted from the ground, and moved three times its own length in its own direction; the left (r.) knee is bent to right angles, and remains so when the foot is placed on the ground. The advanced foot thus carries most of the weight of the body. The trunk and backward leg are in a straight line, the shoulders facing as before, and both feet fully resting on the floor. "*Change feet — óne! Twó!*" (This needs no description.) If the movement is to be done backward, the command is (for the position created above), "*Left* (*r.*) *foot sideways backward — fall ́out!*" In respiratory

[1] Abbrev.: wlk. *d* st.

[2] Compare "memorizing" in the chapter on "Methods of leading the Lessons."

exercises this position is used with the trunk erect instead of inclining. To denote the difference, we then use the command, "*Left (r.) foot, large step, sideways forward (backw.) — plâce!*" In either case, when the movement is practised for the first time, arrange the class so that they stand one foot parallel to the boards of the floor, and the other at right angles to them (facing obliquely to the flank), as this will help the pupils to find the directions in which the feet should move.

Fallout *b* Pos. — This position resembles the previous one, except that the foot is moved parallel with itself forward (backward) (compare walk *a* st. as related to walk *b* st. pos.). Command, "*Left (r.) foot forward (backw.) — fall-ôut!*" or, if the trunk is to be erect, "*Left (r.) foot large step forward (backw.) — plâce!*" The easiest way to get this position correct is by moving the foot backward, especially if the trunk is to remain erect. If the backward foot is not fully resting on the floor, but has the heel raised, the position is called

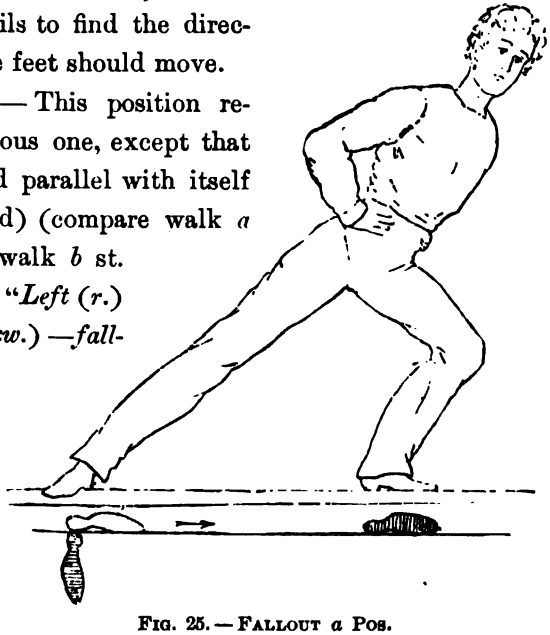


FIG. 25. — FALLOUT *a* POS.

Toe-support Fallout *b* Pos. (Fig. 149, p. 164). —The command for this is, "*Left (r.) foot, toe-supporting, large step backward — plâce!*" The distance between the heels is somewhat more than three times the length of the foot, and the forward knee

is bent a little more than in the fallout *b* pos. If the backward foot is inserted between two of the stall-bars, the position is called

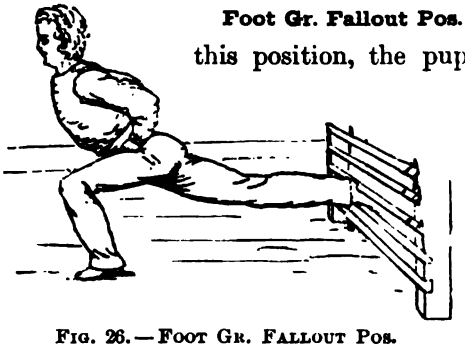


FIG. 26. — FOOT GR. FALLOUT POS.

Foot Gr. Fallout Pos. (Fig. 26). — To get into this position, the pupil stands one step away from the bars, turning his back to them. At the command, "*Left (r.) foot backward — pláce!*" one foot is inserted between two of the bars; and at the command, "*Forward — fall ⌒out!*" the pupil jumps forward into position, the backward knee being stretched to its fullest extent. If the backward foot is lifted free from the floor, the position is called

Hor. Half St. Pos. (Fig. 28). — For this position the command is, "*Horizontal half-standing position, left (r.) leg backward — lift!*" The trunk and backward leg form a graceful curve, and the knee of the supporting leg is bent to nearly right angles.

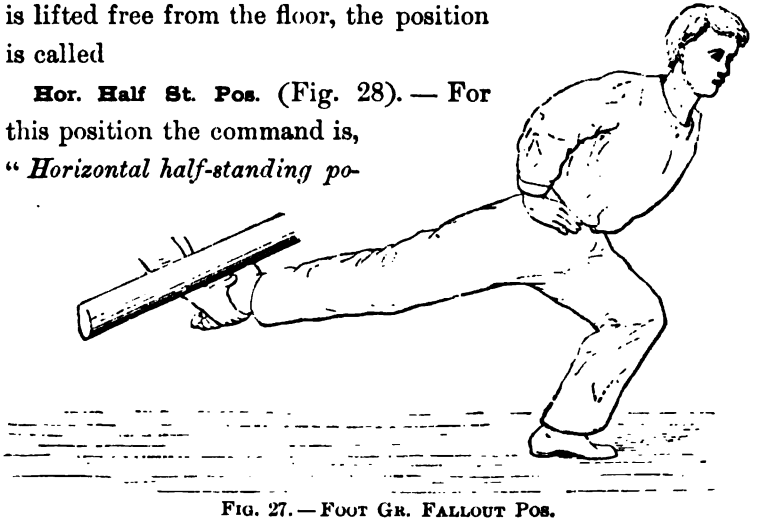


FIG. 27. — FOOT GR. FALLOUT POS.

Fallout *c* Pos. (Fig. 29) is like the fallout *b* pos., but the feet are pointed straight forward as in walk *c* st. pos. The distance between the heels should be three times the length of the foot, but may be less; if otherwise, the backward heel will be raised from the floor. The fall-

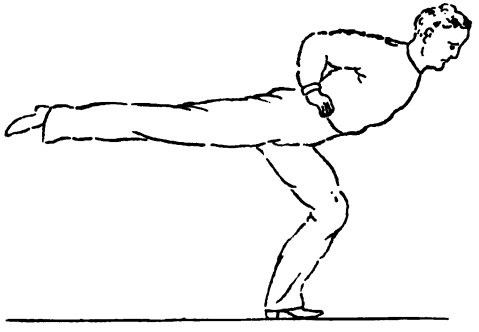


FIG. 28.—HOR. HALF ST. POS.

out positions, except foot gr. fallout, are not suitable for children (under twelve or fourteen years of age), on account of the difficulty of co-ordination.[1]

All the fallout positions belong among balance-movements, although the fallout *c* pos. has also the character of a slow leg-movement on account of the strong extension of the backward calf. All the positions from walk *a* st. to fallout *c* inclusive are to be practised with "hips—firm," which command should immediately precede

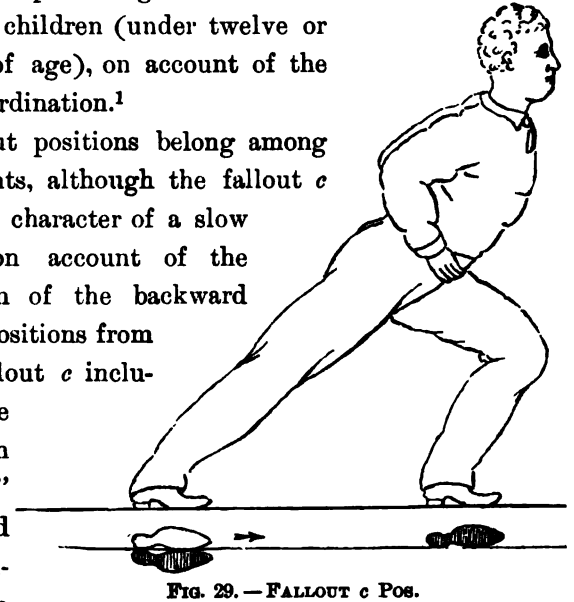


FIG. 29.—FALLOUT *c* POS.

[1] There is also a stride fallout pos. constructed on the same principles, the foot moving three times its own length to its own side. Command, "*To the left (r.)—fallout!*"

these movements. Thus each of these positions should have the prefix "wing," making them: wg. wlk. *a* st.; wg. hor. ½ st., etc.

FIG. 30. — ST. 2 HEEL-ELEV.; WG. TOE ST. POS.

In nearly all of the above positions the movement of (2) heel-elevation can be performed.

St. 2 Heel-elev. (Fig. 30). — Command, "*Heels — lift!*" The heels are quickly raised from the ground, and the pupil stands as high on tip-toe as possible. This position is called **toe-standing.** "*Heels — sink!*" The heels are again lowered, with moderate speed, without tipping the weight of the body backward.[1] On the same principles, the following movements are executed: —

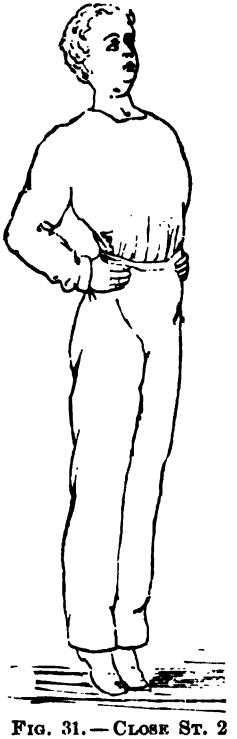


FIG. 31. — CLOSE ST. 2 HEEL-ELEV.

Close st. 2 heel-elev. (Fig 31).

Stride st. 2 heel-elev. (Fig. 32).

Wlk. *a* st. 2 heel-elev.

Wlk. *b* st. 2 heel-elev. (Fig. 33).

Wlk. *c* st. 2 heel-elev.

Walk. *d* st. 2 heel-elev.

In the last five positions the movements can be arranged in series of four counts. For instance: "*Foot-placing sideways*

[1] For further discussion, see Appendix.

forward with heel-elevation, left (r.) foot — óne ! . . . Fóur !" "*The same, right (l.) foot — óne ! . . . Fóur !*" etc. At the first count, the foot is moved out from fundamental position; the heels are raised at the second and lowered at the third; and at the fourth the foot resumes fundamental position.

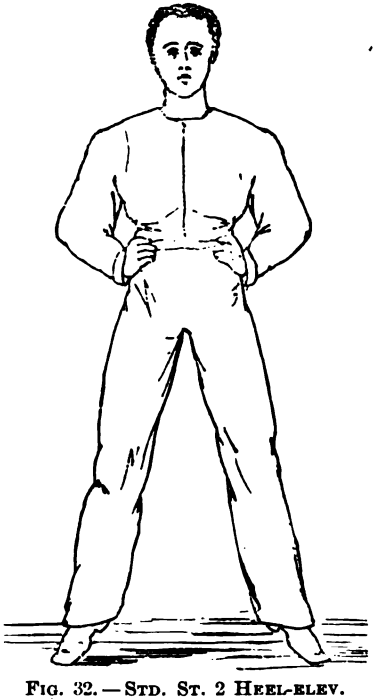


FIG. 32. — STD. ST. 2 HEEL-ELEV.

To increase the difficulty of balance, the movements, which are at first done in wing. pos., are later done with the arms in yard, rest, and stretch positions (see heaving-movements), in the order mentioned. (By raising the arms, the centre of gravity is lifted higher above the base, making the equilibrium less stable.) These movements are soon used as introductions.

FIG. 33.—WG. WLK. *b*. ST. 2 HEEL-ELEV.

Fallout *a* Heel-Elev. (Fig. 34). — Command, "*(Hips — fírm !) Left (r.) foot sidew. forw. — fall óut ! Heel-elevation — one ! Twó !*" Here only the forward heel is raised — not both, as described by some authors. By the raising of the heel, the forward knee is bent still more. In a similar manner is executed

Fallout *c* Heel-elev. — Command, after fallout *c* position is taken, "*Heel-elevation — one ! Twó !*"

These two movements, always done with hips firm, are to be considered chiefly as slow leg-movements: in the first, the quadriceps extensor of the forward leg is being stretched (eccentric activity), in the second, the gastrocnemius of the backward leg (passive extension). Heel-elevation in fallout *b* position is possible, but has but little value, the effort producing a hardly noticeable change in the muscular activity already present in the commencing position.

Alternate Toe-elev. — Command, "*Alternate toe-elevation — óne! Twó!*" . . . The heels remain on the ground, and the balls of the feet are alternately lifted and again put down with a slight pressure, one foot moving up as the other one moves down. (The speed is about seventy movements a minute.) This is done with or without hips firm. After some practice, the command is changed to "*Alternate toe-elevation — stárt!* . . . *Stóp!*" the left foot being the one first lifted. The shoulders should not be tipped from side to side, nor should the body cease to gravitate forward. When done as last described, the movement is very efficient in giving the pupils a true conception of rhythm. To increase this effect, they may be allowed to put the foot down

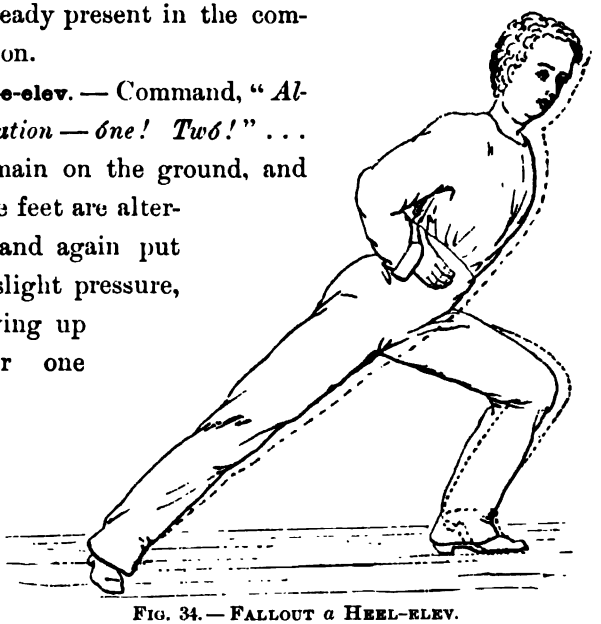


FIG. 34. — FALLOUT *a* HEEL-ELEV.

a little more forcibly than is usually the case. This is also a good means of counteracting the tendency of the pupils to increase the speed of motion. Children usually find it very amusing to do this movement; and in their gymnastics it is used a great deal as an introduction. It is also a slow leg-movement.

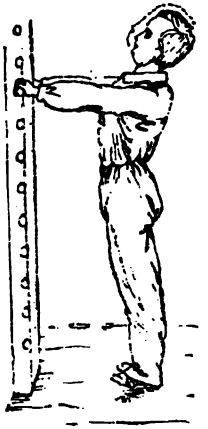


FIG. 35. — REACH GR. ST. ALT. 2 HEEL AND TOE-ELEV.

Alternate 2 Heel and Toe-elev. — Command, "*Alternate heel and toe-elevation — stárt!*" (or *óne! Twó!* . . .). 1. The heels are raised and lowered. 2. The balls of the feet are raised and lowered, and the movement is repeated until the command, "*Stóp!*" is given. The body should not be swaying backward and forward. For beginners the movement may be done in the reach grasp st. pos. (Fig. 35), in which this swaying is not possible.

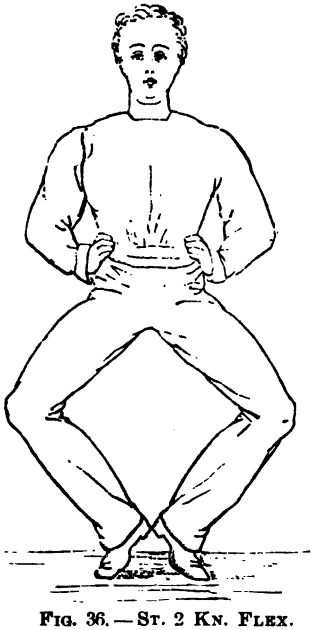


FIG. 36. — ST. 2 KN. FLEX. CRTY. ST. POS.

These two movements are slow leg-movements, the passive extension of the calf (alternating with its active contraction) propelling the blood into the legs, i.e., from the heart.

In some of the above positions both knees can be bent, which movement we call double knee-flexion (= 2 Kn. flex.).

St. 2 Kn. Flex. (Fig. 36). — Command, "*Heels — lift! Knees — bend! Knees — stretch! Heels — sink!*" The knees are

bent to right angles; when so bent, the position is called **courtesy standing.** A common fault in this position is to tip the trunk forward and the pelvis backward. The knees should be pointing in the directions of the feet. This movement is a true balance-movement, to be done with moderate speed; but as it contains the intermediate positions of jumping, after a while the speed and rhythm should vary so that the pupils may become thoroughly balanced in each one of these postures. At such times, the command is, "*Prepare to jump* (or *preparation for jumping*) — *óne! Twó! Thrée! Fóur!*" a pause being made between any two of the executory commands. In this form — in spite of the speed of motion — the movement has also the character of a slow leg-movement, although when used as such it is usually done with its natural rhythm.

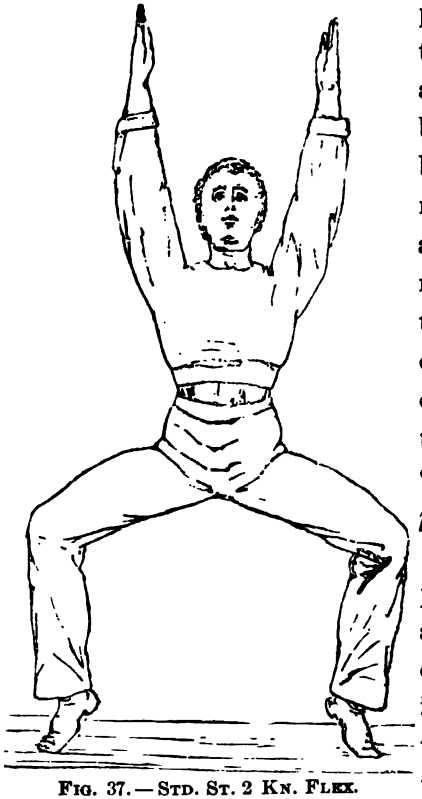


FIG. 37. — STD. ST. 2 KN. FLEX. CRTY. STD. ST. POS.

On the same principles command and execute

Std. st. 2 Kn. flex. (Fig. 37).

Wlk. *b* **st. 2 Kn. flex.**

Wlk. *d* **st. 2 Kn. flex.**

Wlk. *a* **st. 2 Kn. flex.** (Fig. 38). — The command is the same

as for double knee-flexions, but the movement differs from these in that the backward knee is bent the most, the weight of the body being carried chiefly by the backward leg. If both knees were equally bent, the difference between this movement and walk *b* st. 2 Kn. flex. would not be great enough to warrant the use of the two commencing positions. Besides, when done as described, the intermediate position (as shown in the figure) is almost identical with the fundamental position in fencing, for which this movement will thus prepare the way.[1]

FIG. 38. — WALK *a* ST. 2 KN. FLEX.

St. 2 Kn. Flex. to Sitt. Pos. (Fig. 39). — Command, "*Heels — lift! Knees — bend! Sit!*" The knees are bent as far as muscular resistance will allow; the heels come slightly apart.[2] This position is called **courtesy sitting**. The trunk should be as erect as usual. At the command, "*Knees — stretch!*" or "*Upward — stretch!*" the knees are again stretched to toe st. pos.; and at "*Heels — sink!*" the heels are lowered. After some practice, especially for children, the movement may be done in five counts. Com-

FIG. 39. — 2 KN. FLEX. TO SITT. POS.; CRTY. SITT. POS.

[1] Fencing may be considered as gymnastics for advanced classes; hence, one should lead to the other.

[2] For further discussion, see Appendix.

mand, "*Double knee-flexion to sitting position — óne! . . . Five!*" (1. Heels lift. 2. Knees bend to 90°. 3. Knees bend to sitting position. 4. Knees stretch. 5. Heels sink.) "*The same — óne! . . . Five!*" etc. When the movement is done for the first time, the reach grasp st. pos. (compare Fig. 35) may be used to prevent loss of balance.

The movement can also be done from the stride st. pos.: —

Std. St. 2 Kn. Flex. to Sitt. Pos., which is done on exactly the same principles.

In all these 2 Kn. flexs. (from st. 2 Kn. flex. to the one just named inclusive), a progression is made by having the arms in wing, yard, stretch, or rest positions;[1] by staying in the courtesy st. or sitt. position, while a head rotation or 2 A. ext. (for which see heaving-movements) is being executed; or by combining the knee-flexion with an arm-extension. To enumerate all the various movements to which these combinations give rise would take too much space. The following movement, as being the most complicated one, may however be described:

Bend Toe St. 2 A. Ext. and 2 Kn. Flex. — Command, "*Arms upward bend!* (see heaving-movements) *and heels — lift! Arm-extension upward with knee-flexion — óne! Twó!*" . . . 1. The arms are stretched up, and the knees bent. 2. The arms are bent, and the knees stretched. This is especially suitable for advanced pupils.

In the various walk standing positions, as well as in stride st. pos., the double knee-flexion can be done in series of six counts. Thus: "*Foot-placing sideways with double knee-flexion, left (r.) foot — óne! . . . Six!*" 1. Left foot sideways place. 2. Heels lift. 3. Knees bend. 4. Knees stretch. 5. Heels sink.

[1] Because of the greater tendency in rest pos. of pushing elbows, head, and trunk forward, this position comes later than str. pos. in this movement.

6. Position. "*The same right* (*l.*) *foot — óne! . . . Six!*" etc. To be done only by advanced classes. After a while the teacher leaves off counting, when the executory command is, "*Stárt!*" the pupils going through the whole movement, and taking the rhythm from those who stand foremost.

Toe Sup. Wlk. *b* **St. Kn. Flex.** (Fig. 41). — Command, "*Left* (*r.*) *foot, toe supporting, backward — pláce!*" The position is like walk *b* st. (Fig. 40), except that the backward heel does

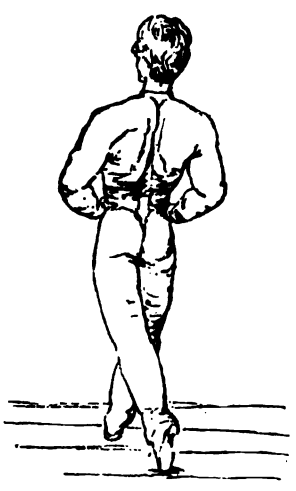


FIG. 40. — TOE SUP. WLK. *b* ST. POS.

FIG. 41. — TOE SUP. WLK. *b* ST. KN. FLEX.

not touch the ground. "*Right* (*l.*) *knee — bend!*" The forward knee is slowly bent until the heel of the (straight) backward leg touches the ground. This causes passive extension of the backward calf, making the exercise a slow leg-movement. It is apt to produce a very faulty posture (on account of the difficulty of attaining muscular isolation, or confining the movement to prescribed parts alone), and consequently must not be given to children.

Instep Gr. St. Kn. Flex. (Fig. 43). — The pupil stands at a distance of twice the length of his foot from the stall-bars or other apparatus (Fig. 42). Command, "*Left (r.) foot backward — pláce!*" The foot is inserted between the third and fourth bars, the knee of this leg being bent. "*Right (l.) knee — bend!*" The knee of the carrying leg is bent as far as the extensibility of the quadriceps of the other leg will allow, the trunk remaining erect with the hips brought well forward. Besides being a

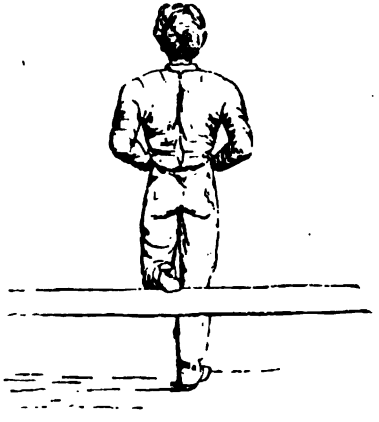


FIG. 42. — INSTEP GR. ST. POS.

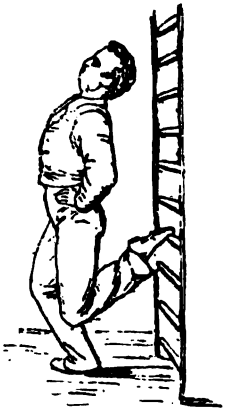


FIG. 43. — INSTEP GR. ST. KN. FLEX.

slow leg-movement, this exercise cultivates the flexibility of the knee, and thus improves the elasticity in jumping.

These two movements can also be done from yd. rest or str. st. positions.

Heel Gr. Half St. Kn. Flex. — The pupil stands facing the stall-bars; and, at the command "*Left (r.) foot forward — pláce!*" he puts this foot between two bars at hip-height (or lower), or he rests his heel on some other convenient apparatus, as shown in Fig. 44. At the command, "*Right (l.) knee — bend!*" the knee of the carrying leg is bent, while the sup-

ported one remains straight, the trunk being erect or slightly inclined forward. The exercise produces a passive extension of the whole under side of the straight leg. A similar effect is received if both knees remain straight, while the trunk is bent forward, which exercise is named

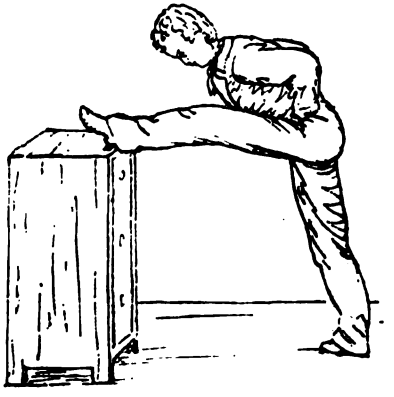


FIG. 44. — HEEL GR. ½ ST. T. FORW. FLEX.

Heel Gr. Half St. T. Forw. Flex. (Fig. 44). — The commencing position is the same as above. The command for the movement is, "*Trunk forward — bend! Upward — stretch!*" (Compare arch-flexions.) A similar effect is also received by

FIG. 45. — STR. WLK. *b*, ST. T. FORW. FLEX.

Str. Wlk. *b* St. T. Forw. Downw. Flex. (Fig. 45).—Command, "*Left (r.) foot forward and arms upward — stretch!*" The forward foot is braced against the horizontal bar, resting on the floor (or against a platform, etc.). "*Forward, downward — bend!*" The trunk is bent as far as good posture will allow. Both legs remain straight, and the backward heel must not leave the floor. "*Upward — stretch!*"[1]

½ Wing Yard Gr. Cr. *b* ½ St. Kn. Flex. (Fig. 46). — Command, "*Right (l.) side to the bars. Left (r.) hand hip firm, right (l.) hand grasp*

[1] The last five exercises are slow leg-movements.

at hip-height! Left (r.) leg forward — lift!" The leg is lifted straight forward to nearly horizontal position. "*Heel — lift! Knee — bend! Knee — stretch!*" . . . The knee of the carrying leg is bent to right angles (or to sitting position), while the lifted leg remains straight and horizontal and the trunk erect. A common fault is to tip the body backward. This movement can also be done without heel-elevation. Instead of the stall-bars, the back of a chair, the shoulder of another pupil, etc., may serve for support.

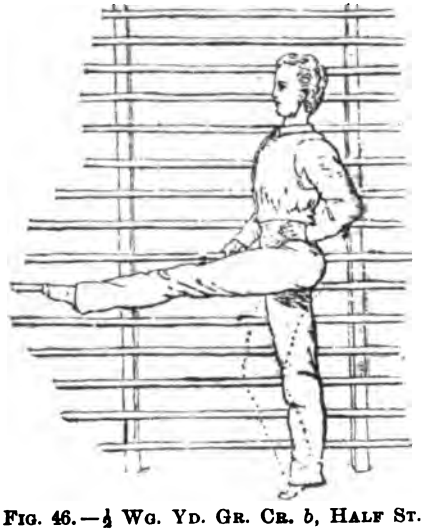


FIG. 46.—½ WG. YD. GR. CR. *b*, HALF ST. KN. FLEX.

Rch. Gr. Cr. *b* ½ St. Kn. Flex. (Fig. 47).—The pupils grasp the horizontal bar, which they are facing (or the hands of the other pupils, as shown in the figure). Command, "*Left (r.) leg forward — lift! Heel — lift! Knee — bend!*" . . . etc. The movement is executed on the same principles as the

FIG. 47.—REACH GR. CR. *b* ½ ST. KN. FLEX.

one just described, — with or without previous heel-elevation, and to 90° or to sitting position. Without support for the hands (entirely free-standing), the movement is performed in a like manner. It is then called

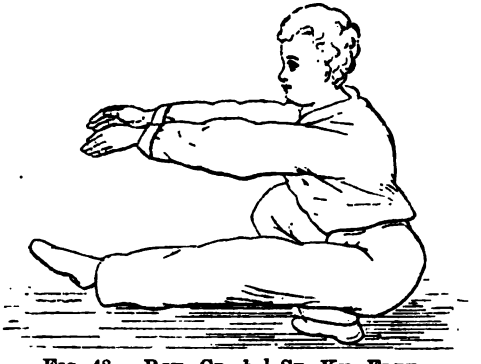


FIG. 48. — RCH. CR. *b* ½ ST. KN. FLEX.

Rch. Cr. *b* ½ St. Kn. Flex. (Fig. 48). — This movement is always done without heel-elevation. Command, "*Arms and left (r.) leg forward — lift! Knee — bend!*" etc.[1]

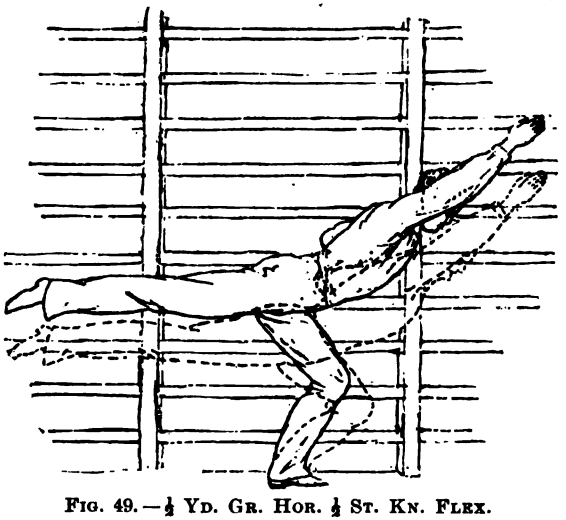


FIG. 49. — ½ YD. GR. HOR. ½ ST. KN. FLEX.

Half Yard Gr. Hor. Half St. Kn. Flex. (Fig. 49). — One hand grasps the stall-bars, the other takes hips firm. Command, "*Horizontal half standing position, right (l.) leg backward — lift!* (Performed as described above.) *Left (r.) knee — bend!*" The

[1] This movement may be preceded by Rch. Crty. sitt. L. ext. forw. Command, " . . . *sit! Arms forw. — lift! Left (r.) leg forw. — stretch! Change legs — one! Two!* (1= Rch. crty. sitt.)." Later the change occurs in one motion by a slight jump. Command, " *Change legs — one!! Two!!*" . . .

knee is bent as far as possible. "*Knee — stretch!*" The knee resumes its former flexion (about 90°). This can also be done with previous heel-elevation and with one arm extended upward (hlf. str. yard gr. hor. half st. pos.) as shown in the figure. The movement can also be free-standing, and is then called

Horizontal Half. St. Kn. Flex. — It is executed as above, always without heel-elevation. It may be done from wg., yd., ½ str., str., or rest pos. When only one arm is extended upward, the position may be either left (r.) arm up, and left (r.) leg lifted backward, or *vice versa*. The last five movements are both balance-movements and slow leg-movements. Improving the flexibility of the knee, they also improve the elasticity required in jumping. The str. and half str. hor. half st. Kn. flex. are also shoulder-blade movements, on account of the difficulty of keeping the arms in correct position.

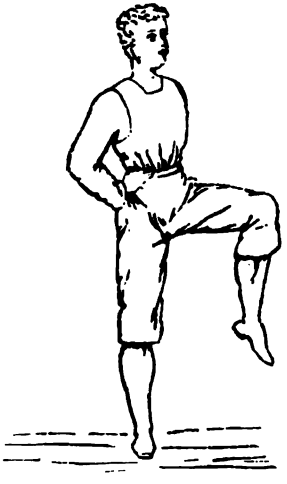


FIG. 50. — WG. CR. *a* ½ ST. POS.

Crook *a* ½ St. Pos. (Fig. 50). — Command, "*Left (r.) knee upward — bend!*" The leg is slowly lifted forward and upward until the hip and knee are bent at right angles; the instep is stretched, so that the toes are pointing downward; the knee is pointing sideways forward. Common faults are to tip the shoulders to the opposite side, to incline the trunk backward, and to bend the knee of the leg that carries the body. "*Change feet — one! Two!*" 1. The lifted foot is put down. 2. The other leg is raised as above. For beginners the change of feet is done quickly and rhythmically, as this is easier to do (seventy

to a hundred movements a minute). When done this way, the knee is lifted somewhat higher. In this form the exercise forms a substitute for marching, when space does not allow the latter; and as marching, it can also be done on tip-toe — when a slight motion forward is allowed — and in double-quick time.[1]

FIG. 51. — REACH GR. ST. ALT. KN. FLEX. UPW.

Beginners, who are not able to take the crook half st. pos. correctly, may for a while be allowed to use support, the exercise then being **Reach Gr. St. Alternate Kn. Flex. Upw.** (Fig. 51), which is done on exactly similar principles.

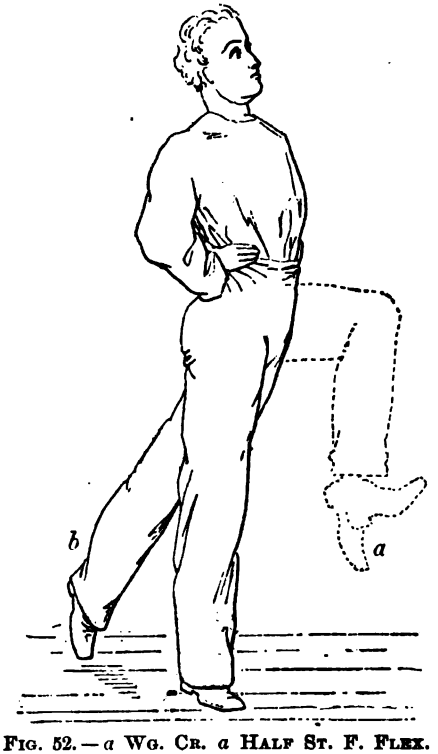


FIG. 52. — *a* WG. CR. *a* HALF ST. F. FLEX. AND EXT.; *b* WG. ½ ST. POS.; WG. CR. *a* ½ ST. KN. EXT. BACKW.

In the crook half st. pos. various exercises are done in progression, as enumerated below: —

Crook *a* ½ St. F. Flex. and Ext. (Fig. 52 *a*). — Command, "*Left*

[1] Very advanced pupils may also do the slow movement from toe st.; viz., Cr. *a* toe ½ st. pos.

(*r.*) *knee upward — bend! Foot flexion and extension — one! Two!*" . . . The figure is sufficient explanation.

Crook *a* ½ **St. Kn. Ext. Backw.** (Fig. 52 *b*). — Command, "*Left* (*r.*) *knee upward — bend! Knee backward — stretch! Upward — bend!* . . . The knee is extended as far backward as good posture will allow; i.e., without bending the trunk forward.[1]

Crook *a* ½ **St. Kn. Ext. Forw.**[2] (Fig. 53). — Command, . . . "*Knee forward—stretch! Bend! Stretch!*" . . . Common faults are, to lean over backward, and to bend the knee of the carrying leg. To correct these, supports (Fig. 54) may be allowed for a short time.

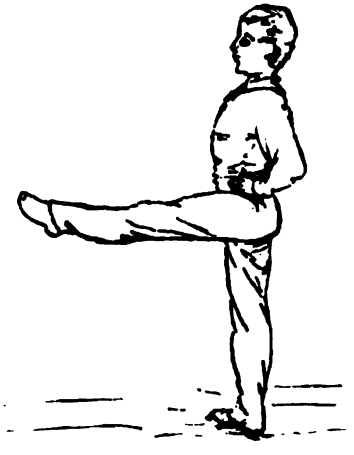


FIG. 53. — CROOK *a* ½ ST. KN. EXT. FORW. CR. *b* ½ ST. POS.

Crook *a* ½ **St. Kn. Abd.** — Command, . . . "*Knee abduction — one! Two!*" . . . 1. The raised leg is moved as far sideways as good posture will allow. 2. It is moved back to original position. The shoulders (and trunk) should not be twisted from side to side.[3]

In all these balance-movements, progression is made from wing to yard, rest and str. st. positions, as enumerated; yet so that when the leg moves forward the str. st. pos. precedes the rest st. pos., as the former one is less apt to produce a faulty posture in this movement. (See foot-note under 2 Kn. flex.)

[1] This movement may be preceded by St. L. elev. backw. Command, "*Left* (*r.*) *leg backward — lift! Change feet — one! Two!*" the final position looking as Fig. 52 *b*.

[2] = Cr. *b* ½ st. pos. This may also be taken by St. L. elev. forw. Command, "*Left* (*r.*) *leg forward — lift!*"

[3] There is also a Cr. *b* ½ st. L. abd.

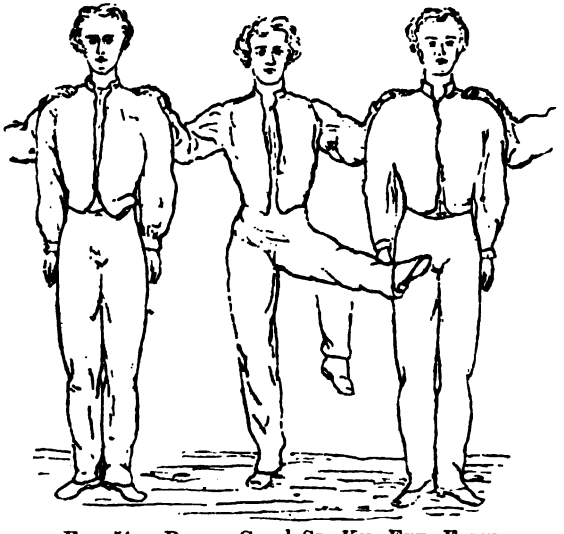


FIG. 54. — REACH GR. ½ ST. KN. EXT. FORW.

St. L. Elevation Sidew. (Fig. 55). — Command, "*Left (r.) leg sideways — lift!*" The weight of the body is removed to the right (l.) leg, and the straight left (r.) leg is lifted sideways as far as possible. The shoulders are kept level, and the trunk erect. "*Change feet — one! Two!*" . . . 1. The lifted foot is again put down beside the other one. 2. The other leg is raised as above.[1] The movement is made more difficult by using either of the wing, rest, str., or yard st. positions in the order enumerated. The yard pos. is put last, because, in this exercise, it is more difficult to maintain than any of the others. Finally, the movement can be done from toe st. pos.,[2] when it is best to have the arms in stretch pos. Com-

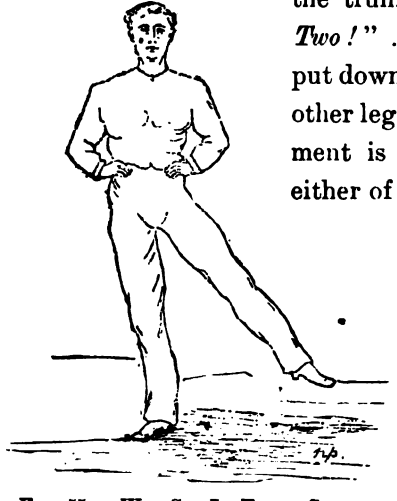


FIG. 55. — WG. ST. L. ELEV. SIDEW.

[1] The change can also be done in one count.

[2] All the preceding movements, from Cr. *a* ½ st. onward, can also be done from toe st. pos.

mand, "*Arms upward — stretch! and heels lift! Leg-elevation sidew. — one! Two!*" . . . The movement is executed with more speed in this than in the other positions.

Leg-elevation sideways is also a lateral trunk-movement, since it brings into play the muscles around the waist; but when used as such, it is best done from other commencing positions.

Among leg-movements we also classify marching and running. Marching in ordinary time is one of the best slow leg-movements. Marching on tip-toe is an excellent balance-movement, and is one of the best exercises to correct a faulty posture. Command, "*Hips firm and feet — close! Heels — lift! Slowly forward march— one! Two!*" . . . This movement is also done with neck firm or arms upward stretch, and later on with

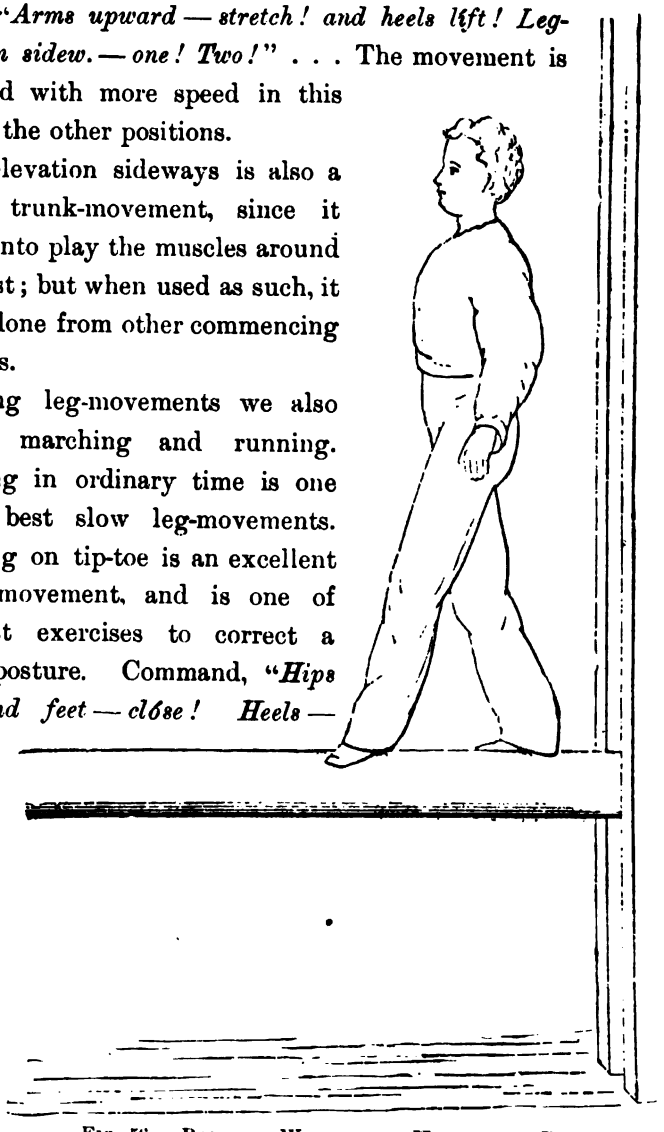


FIG. 56. — BALANCE WALKING ON HORIZONTAL BAR.

the feet turned out. The shoulders should be kept level throughout the exercise, which is then one of the best means of correcting the bad habit of tipping the shoulders from side to side when walking. Taking place on tip-toe, the movement also counteracts the tendency we all have to walk on our heels: it teaches us to land on the balls of our feet, making the steps springy and graceful.

As balance-movements, we can use various forms of balancing on the horizontal bar (Fig. 56), an exercise which can be done backward as well as forward, and is too familiar to us all to need any description. The bar (at first at knee-height or lower) should have the flat side up until the pupils have gained some proficiency in the movement. After that the round side may be turned up, and the bar may be gradually raised.

BALANCE-MOVEMENTS GROUPED BY TYPES.[1]

wg. yd. rest str.: st. / close st. / std. st. / wlk. *a*, *b*, *c*, *d*. } 2 heel-elev.
wg. yd. rest str.: st. alt. toe-elev.
wg. yd. rest str.: st. alt. toe and heel elev.
wg. yd. rest str.: close toe st. slow march.

wg. yd. str. rest: st. / std. st. / wlk. *b*, *a*, *d*, st. } 2 Kn. flex. to crty. st. pos.
wg. yd. str. rest: st. / std. st. / toe st. / toe std. st. } 2 Kn. flex. to crty. sitt. pos.

wg. yd.: toe st. / crty. { st. / sitt. / std. st. / std. sitt. } H. rot.

crty.: st. / std. st. / sitt. / std. sitt. } 2 A. ext. sidew. / yd. *a* 2 A. fling. / ½ str. yd. 2 A. ext. / 2 A. ext. upw. / yd. *d* 2 A. elev.

Bend toe st. 2 A. ext. { sidew. / upw. }
yd. *d* toe { st. / std. st. } { 2 A. elev. } } with 2 Kn. flex.

wg. fallout, *a*, *b*, *c*, *d*, pos.
wg. fallout, *b* L. elev. backw.

wg. yd. rest str.: st. L. elev. { sidew. / backw. / forw. }
wg. yd. rest str.: cr. *a* ½ st. pos.
wg. yd. rest str.: cr. *a* ½ st. F. flex. and ext.
wg. yd. rest str.: cr. *a* ½ st. Kn. ext. backw.
wg. yd. rest str.: cr. *a* ½ st. Kn. ext. forw.
wg. yd. rest str.: cr. *a* ½ st. Kn. abd.
wg. yd. rest str.: cr. *b* ½ st. { L. abd. / L. circ. }

wg. reach { crty. sitt. L. ext.
Reach cr. *b* ½ st. Kn. flex.
Reach cr. *b* ½ crty. sitt. ch. L.

wg. yd. ½ str. rest str.: hor. ½ st. { pos. / Kn. flex. }
str. hor. ½ st. Kn. flex. to reach cr. *b* ½ crty. sitt. pos.

[1] For progressive list of balance-movements, see Appendix.

ARCH-FLEXIONS.

Synopsis:

ARCH-FLEXIONS.

- *Aim:* Cultivate extensibility of expiratory muscles. / Supple the chest.
- *Contents:* False (excentric action). — Sagittal. / True (passive extension). — Lateral.
- *Types:* Gr. arch st. 2 Heel-elev. / Oblique gr. arch st. 2 Heel-elev.
- *Effects:*
  - Physical.
    - Widen inferior chest.
    - Straighten dorsal spine.
    - Flatten shoulder-blades.
    - Draw up viscera.
  - Physiological.
    - Thoracic aspiration.
    - Increased possibility of respiration.
- *Progression:* False to true to false.
  - 1. 2. wlk. *c*, *b*, st.
  - 3. Turn wlk. *a* st.
  - 4. Turn stride st.
  - 5. Turn wlk. *b* st.
  - 6. Close st.
  - 7. Turn st.
  - 8. St.
  - 9. Turn close st.
  - 10. Stride st.

  → Progression of base of false arch-flexions.
- *Limitations:* Quantity: one in each lesson. / Quality: proportioned to heaving-movement.
- *Relations:*
  1. Prepare for heaving-movement.
  2. Depend on shoulder-blade movements.
  3. Resemble abdominal exercises.
  4. Prepare for vaulting.
  5. Merge into heaving-movements. / vaulting.

Arch-flexions[1] consist of backward-flexions of the trunk executed by an arching backward of the spine, each vertebra taking part in the movement. The chest becomes lifted, the ribs are spread apart anteriorly, and the muscles of the epigastric region become stretched. As these, the muscles of forced exhalation, ordinarily offer resistance to inhalation, the movement, cultivating their extensibility, diminishes the resistance and so produces an increased possibility of inspiration.

The ribs being spread apart, the chest widens; and as it also becomes elevated its total capacity increases similarly as at

[1] Swedish: *Spännböjning* = tense-bending, possibly "span-bending." "Arch-flexion" best emphasizes and describes the movement.

inhalation; the viscera become drawn up and the venous afflux toward the chest increases.

The first effort of the movement occurs in the upper dorsal muscles, straightening this portion of the spine as well as flattening the shoulder-blades. Also the invertebral substances become compressed behind, distended in front, and by constant repetition the movement will make these effects permanent so that the spine will be held erect mechanically without special effort.

Arch-flexions done on apparatus are called true, for here, after arch. pos. has been assumed, the expiratory muscles are in passive extension, the arch being maintained by the contraction of the posterior muscles, while in the free-standing or false arch-flexions the anterior muscles are active to prevent loss of equilibrium (unless the movement has been driven to the ligamentous limit of the muscles, when they are in passive extension); and although they are stretched, their extension cannot be as complete as in the apparatus-movement. For the same length of lever the false arch-flexions are stronger than the true, for in the latter the weight is carried by both hands and feet,[1] while in the former it is carried by the feet alone. For that reason true arch-flexions precede the false ones of the same type; yet so that free-standing backw. flex. precedes gr. arch st. pos., since it is necessary to pass through the former in order to assume the latter. An instance of this progression would be str. st. arch flex. — Gr. arch st. 2 A flex. and ext. — Str. arch st. 2 A ext. upw.

Arch-flexions without rotation of the trunk are called sagittal, those with rotation lateral. On apparatus the last kind is produced by grasping with one hand below the other one,

[1] Or at least not by the feet alone.

the arch becoming stronger on the side of the lower hand. Free-standing substitutes for lateral arch-flexions are those lateral trunk movements which consist of trunk backw. flex. from preceding rotation, and which are to be considered as emphasized trunk-rotations rather than as arch-flexions; for here the plane of the hands is no longer parallel with that of the heels, and hence the mechanics are quite different from those of arch-flexions proper. Besides, while the true lateral arch-flexions are stronger than the true sagittal ones, the false lateral are easier than the false sagittal, the base usually being longer.

Typical arch-flexions are Gr. arch st. 2 heel-elev. and oblique gr. arch st. 2 heel-elev., the first being sagittal, the second lateral, the movement in each increasing the passive extension produced by the commencing position.

Progression of true arch-flexions is made by so changing the movement as to increase the arch, the extension of the muscles. In the free-standing movements progression follows the usual laws for change of base and lever, the elucidation of which belongs to General Kinesiology. Speaking generally, the progression of arch-flexions should be slow, especially for women, as the movement is quite severe.

The strong pressure on vessels and nerves occurring in backward flexions of the trunk readily produces a backache from spinal congestion. To counteract and prevent this, backw. flex. should always be followed by forw. or forw. downw. flex.; for if the trunk is bent forward (downw.) the posterior muscles of the legs become stretched, and an effect similar to that of slow leg-movements is obtained — at least a backache produced by backw. flex. becomes at once relieved. For this reason the abbreviation "arch-flex." stands for "backw. flex. followed by forw. (downw.) flex."

Usually only one arch-flexion is given in each lesson,[1] and it should precede the heaving-movement if the latter is done on apparatus. For the hanging pos. forcibly stretching the superior abdomen (epigastric region), a lameness will occur here, unless the movement has been preceded by a gradual leading-up to it by a milder form of extension. Besides, since the heaving-movements cultivate the power of respiration, it is proper to prepare for them by first increasing the possibility of respiration: it is like taking off the tight clothing before beginning to exercise. When the lessons consist chiefly of free exercises the arch-flexion is best put nearer the middle of the lesson, as it is then one of the strongest exercises in the lesson. In any case, the arch-flexion should, as far as possible, be made to correspond in strength to the heaving-movement of the same lesson.

The first effort of the arch-flexion being that of lifting the pectoral chest (by contraction of posterior muscles), it will be found that the shoulder-blade movements of expansion will regulate the progression of arch-flexions, so that none of these with long levers should be attempted unless the pectoral chest has been made sufficiently extensible. For if the pupil is "chest bound," the only flexion possible will be in the lumbar region, and then the movement ceases to be an arch-flexion.

Arch-flexions resemble those abdominal exercises which consist of backw. flex. of the trunk; but in the latter the spine remains straight and the body merely falls back, the details of which difference will be dealt with more fully in the chapter on abdominal exercises.

Some heaving-movements, like arch. hang., etc., and some vaulting exercises include the effects of arch-flexions, but are

[1] If there are two heaving-movements there is no reason why another arch-flexion cannot precede the second heaving-movement if the case should so require.

not described as such; for the rule is to classify the movements according to their most pronounced effects, even though there are others definite enough to entitle them to reappear in other groups.

Arch-flexions may be said to polish the execution of vaulting, for in almost all vaulting exercises the form depends on a correct arching of the body in the intermediate stages of the movement. Good examples of this are face-vault over box and leap-frog on buck or horse.

FIG. 57.—T. FLEX. BACKW.

In all the backward flexions described below the whole spine should partake of the flexion—that is, the back should not be bent merely at the waist. For this reason, let the head begin the movement backward, and let it be the last to move forward. Respiration should be free, and an occasional "*Bréathe!*" from the teacher is not out of place. Another excellent bit of advice when backward flexion takes place is, "*Look at the opposite wall!*" (or, if at the stall-bars, "*Look at the bars!*"); this reminds the pupil to let the head also move backward. In forward flexion you say, "*Look at the ceiling!*" which order prevents the head from losing its good posture. Whether the flexion is backward or forward, the knees should be kept straight.[1]

[1] In very deep backw. flex. a slight flexion of the knees is allowed.

St. Arch Flex. — Command, "*Trunk backward — bend!*" The trunk is arched slowly backward (Fig. 57). The position thus arising is called **arch st. pos.** "*Upward — stretch!*" The trunk resumes fund. pos. "*Trunk forward — bend!*" The trunk is bent slowly forward with fully expanded chest (Fig. 58). This position is called **stoop st. pos.** "*Upward — stretch!*" The trunk resumes fund. pos. The movement can be done from wlk. *c*, *b*, close st., st., and stride st. pos., going from the larger to the smaller base.[1] The progression of lever is, wg., yd. *c*., ½ str. wg., rest, str. in backw. flex., and wg., yd., str., rest in forw. flex. [Rest and ½ str. wg. forw. flex. are to be considered as shoulder-blade movements.] Thus we have

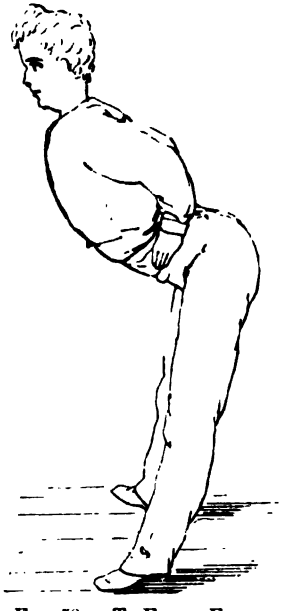


FIG. 58. — T. FLEX. FORW.

wg.	wlk. *c*.	
yd. *c*.	wlk. *b*.	
½ str. wg.[2]	close st.	arch-flex.
rest.	st.	
str.	std. st.	

T. Flex. Forw. and Downw. (Fig. 59). — As soon as the flexion forward can be well executed, it may also be done downward. The arms should always be in str. pos., as otherwise the movement causes compression of the chest. Command, "*Arms upward — strétch!* (for which see heaving-movements.) *Trunk . . . forward, downward — bend!*" The trunk is bent as far as good posture of the head, arms, shoulders, and chest will allow,

[1] In wg. pos. before wlk. *b* pos., etc., have been practised, the progression is st. close st., stride st., wlk. *b*, *c*, i.e., from the simple to the complex.

[2] In ½ str. wg. wlk. *b* (*c*) arch-flex. the right arm is in ½ str. pos. when the left foot is in advance, and *vice versa*.

the hands reaching out as far as possible. It is only after very long practice that the hands touch the ground. "*Upward — stretch!*" The trunk resumes fund. pos., the movement commencing at the hands, which are the first to move upward backward. The small of the back should be concaved and the dorsal part flattened during the movement, so that the back is not convexly curved (in the familiar attitude of a frightened cat), but the chest must be thoroughly expanded throughout the movement. The exercise is also done from any of the foot-positions given above, the order of progression being the reverse. For children and beginners the downward flexion may be done with less attention to good posture, and the hands made to touch the floor; for, the arms being extended upward (as related to the trunk), the compression of the chest is never excessive. Done in this way, the final position looks as in Fig. 60, which for an advanced pupil is decidedly faulty. When thus done, the movement is executed a little more quickly.[1]

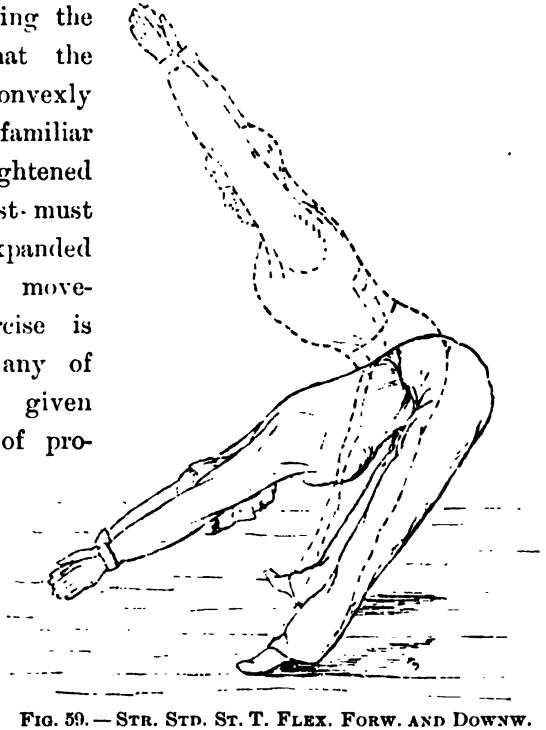


FIG. 59. — STR. STD. ST. T. FLEX. FORW. AND DOWNW.

[1] In order that the arms, in swinging up, may expand the chest.

If, after downward flexion, you wish the pupils to stretch to stoop st. pos., command, "*Forward — stretch!*" when the pupils take the position marked by dotted lines in Fig. 59. This mode of dividing the "upward stretch" into two parts is a good safeguard against faulty movement.[1]

If you wish to increase the effect of the backward flexion, make the pupils stay in arch st. pos., and do some movement while staying there. Thus we have:

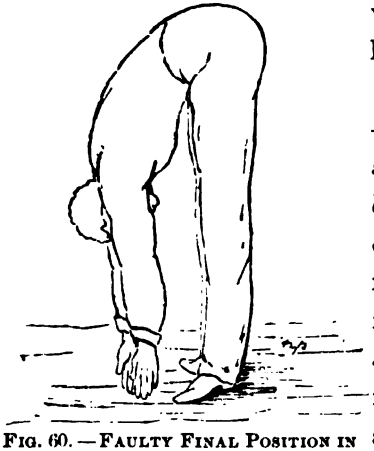


FIG. 60. — FAULTY FINAL POSITION IN TRUNK FLECTION DOWNWARD.

Str. Arch St. 2 A. Ext. Upw. — Command, "*Arms upward — strétch! Trunk backward — bend! Arm-extension upward — one! Twó!* . . . (for which movement, see heaving-movements.) *Trunk upward — stretch!*" etc. The movement may also be done from bend arch st. pos., which is a little easier. From this position each arm may be alternately extended, the final position then being half str. bend arch st. pos. Similarly we have

Bend arch. { 2 A. ext. sidew. / alt. A. ext. upw. }
Bend arch. / Str. arch. / Yd. *a* 2 A. fig. { 2 A. ext. upw. }
} from { wlk. *c*, *b*. / close st. / st. / stride st. } pos.

which need no special description.

A still further progression can be made by combining the arm-movement with a change of feet, as for instance

Str. Arch Wlk. *b* St. 2 A. Ext. and Change of F. — Command,

[1] The progression of base in forw. downw. flex. is std. st., st., close st., wlk. *b* st., wlk. *c* st.

"*Left (r.) foot forward place and arms upward stretch — one! Two!*" 1. Arms upward bend. 2. Arms upward stretch, and left (r.) foot forward place. "*Trunk backward — bend! Arm extension and change of feet — one! Two!*" . . . 1. Arms upward bend, and place the forward foot beside the backward one. 2. Place the other foot forward, and stretch the arms upward. • This exercise is quite powerful. Similar movements are: —

Yd. *c* wlk. *b* (*c*) arch st. 2 A. ext. sidew.
Yd. *a* wlk. *b* (*c*) arch st. 2 A. flg. } and ch. of F.
Bend arch st. alt. A. ext. upw. and F. pl. forw.[1]

(**Str.**) **Gr. Arch St. Pos.** (Fig. 61). — This is the first true arch-flexion. The class stands at the bar-stalls, one pupil at each, with his back turned to the bars. Command, "*A short step forward — márch! Arms upward — strétch! Trunk backward — bend! (Look at the bars!)*" The trunk is bent backward until the hands touch a bar; at first the hands merely rest on the bar, later on they grasp it with the palms under the bar, the thumbs in front of it, and both hands holding the same bar. If one hand grasps a bar below that held by the other, the position is called **oblique gr. arch st.** (Fig. 75). If only one arm is up, the position is called **half str. gr. arch st.** (Fig. 62). The latter is stronger than **str. gr. arch st.**

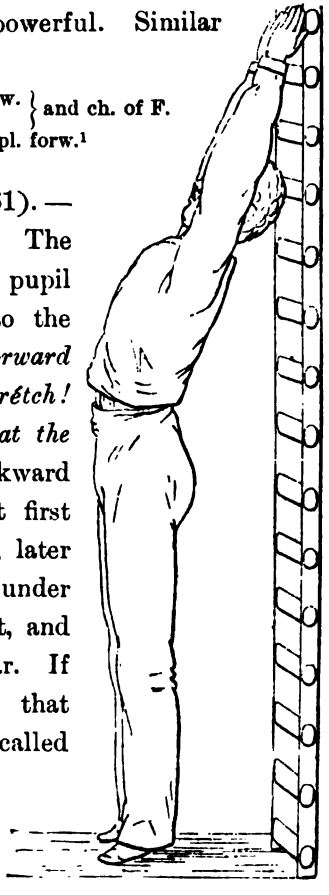


FIG. 61. — STR. GR. ARCH ST. POS.

[1] See foot-note 2 on page 90.

In absence of apparatus the wall may serve for support, the hands resting against it (Fig. 63). Or the pupils of the second rank may serve as supports (Fig. 64). The command then is, "*First rank, arms upward — stréteh! Trunk backward — bend! Second rank, support — stánd!*" The men in the second rank place one foot backward so as to get a steady posture, and put their arms up, the wrists of the first rank resting in the hands of the second. Those giving the support should take care not to push the arms of the others forward (and to remain as rigid as possible). To avoid this tendency the support may instead be given by one hand on the neck (Fig. 65). Still another way is to do the movement with neck firm, the support then given at the elbows (Fig. 66). This form is probably the least productive of faulty posture, as here the weight of the head presses the arms backward, forcing the chest to be vaulted. To use living supports is usually not suitable for children,[1] although a skilled teacher may safely try it also for them.

FIG. 62. — ½ STR. GR. ARCH ST.

Instead of *bending* backward, beginners are apt to *fall* against the apparatus, thus compressing their chests and pushing their heads forward. To correct this, the movement should alternate with the following one: —

[1] Because a child is not steady enough and also likes to wrestle with the one taking the movement.

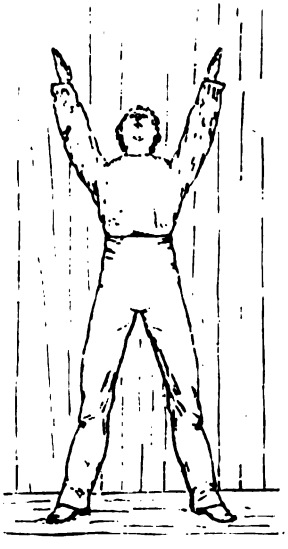


FIG. 63.

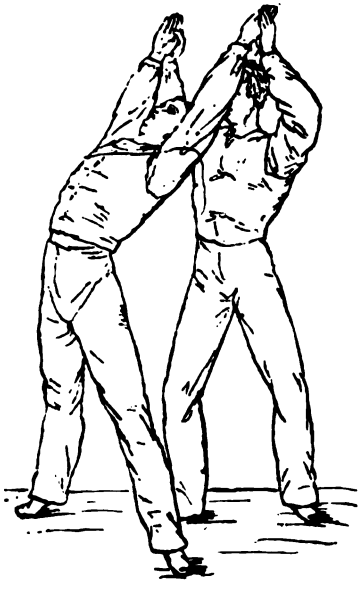


FIG. 64.

FIG. 65.

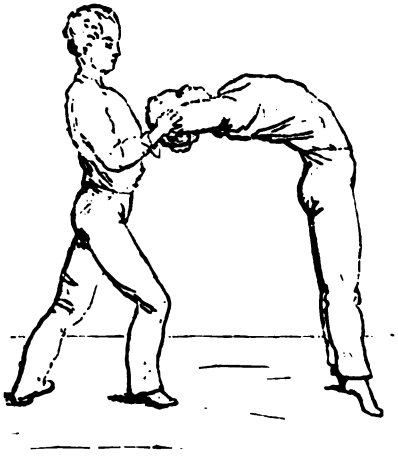


FIG. 66.

Str. Support St. Arch Flex. (Fig. 67). — The horizontal bar is put so low that it rests against the sacrum when the pupil stands close up to it with his back turned to it. Command, "*Arms upward — strétch! Trunk backward — bend!*" etc. The bar now compels the pupil to arch instead of falling backward. This movement can also be done with living supports (Fig. 68). Command, "*Numbers two (one) chain support — stánd!*" The indicated numbers lock hands, and rest them in the small of the backs of those in front of them, and take the fallout *b* pos. forward to gain a firm posture. The movement now takes place in usual order. Suitable only for grown persons.

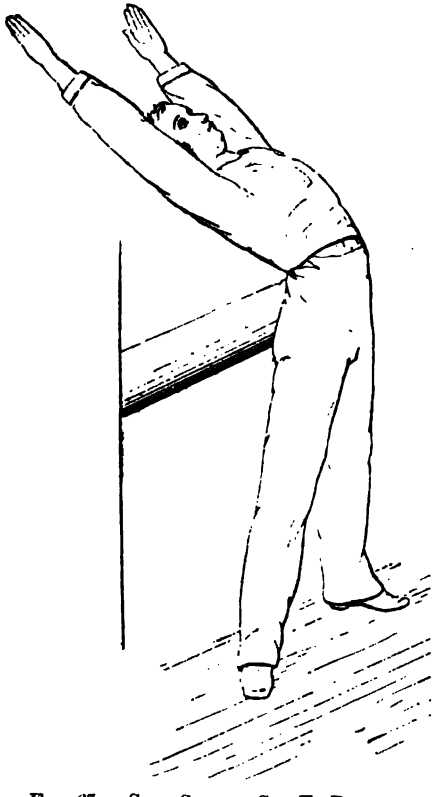


FIG. 67. — STR. STRIDE ST. T. BACKW. FLEX. OVER BAR.

All of the movements just mentioned are done in stride. st. pos. as well, and the flexion over the bar can be made stronger by adding 2 A. ext. in the arch st. pos.; thus we have —

Bend arch. sup. { std. st. / st. } { 2 A. ext. sidew. / alt A. ext. / 2 A. ext. } { upw.

Yd. *a* arch sup. { std. st. / st. } 2 A. flg.

The arch-flexion over bar can also be done from wg., ½ str., yd. *c*, and rest pos. These movements are easier than the corresponding free-standing exercises.

Str. Gr. Arch. St. 2 Heel-elev. (Fig. 69). — Command (after arranging the pupils at the apparatus), "*Arms upward — strétch! Trunk backward — bend! Grásp! Heels — líft! Sink! The same — óne! Two!*" . . . Arms and legs must be kept straight. When the heels are raised, the chest becomes still more arched than when the feet rest fully on the ground. Unless the head is kept well backward and the body generally well balanced, it is not possible to do the movement without cramping the chest. The movement may be done with living supports (Figs. 64, 65, 66).

FIG. 68. — STR. ARCH SUP. ST. 2 A. EXT.

FIG. 69. — STR. GR. ARCH ST.
2 HEEL-ELEV.

FIG. 70. — GR. ARCH STD. ST.
2 HEEL-ELEV.

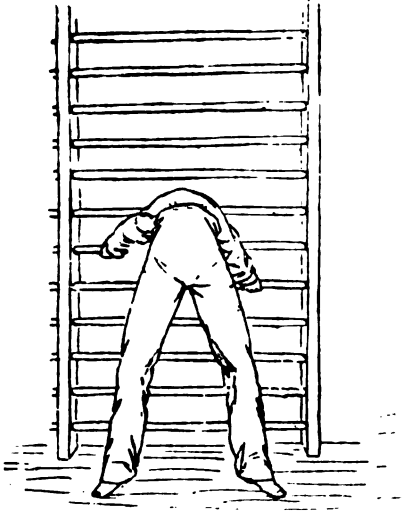


FIG. 71. — OBLIQUE GR. ARCH STD.
ST. 2 HEEL-ELEV.

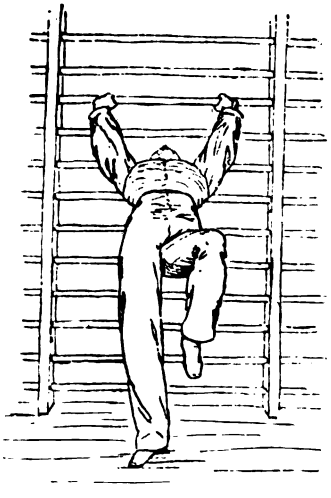


FIG. 72. — GR. ARCH ST. KN.
UPW. FLEX.

The same exercise can be done in stride pos., and in either position also with oblique grasp and ½ str. gr.: —

Gr. / Oblique gr. / ½ str. gr. } arch. { stride st. / st. } 2 Heel-elev.

Gr. Arch St. Kn. Upw. Flex. (Fig.72).—After the commencing position (gr. arch st.) has been taken, command, "*Left (r.) knee upward — bend!*" The limb is bent so that the thigh is horizontal, the leg vertical, and the foot pointing downward. The other limb remains straight. "*Change feet — one! Two!*" . . . 1. The foot is put down. 2. The other leg is raised in a similar manner. The exercise is done also with oblique grasp. For advanced pupils it may be done as follows: "*Knee-elevation — one! . . . Four!*" or, still later on, "*Knee-elevation — one! Two! One! Two!*" . . . when the knee is quickly raised as soon as the other foot touches the ground.

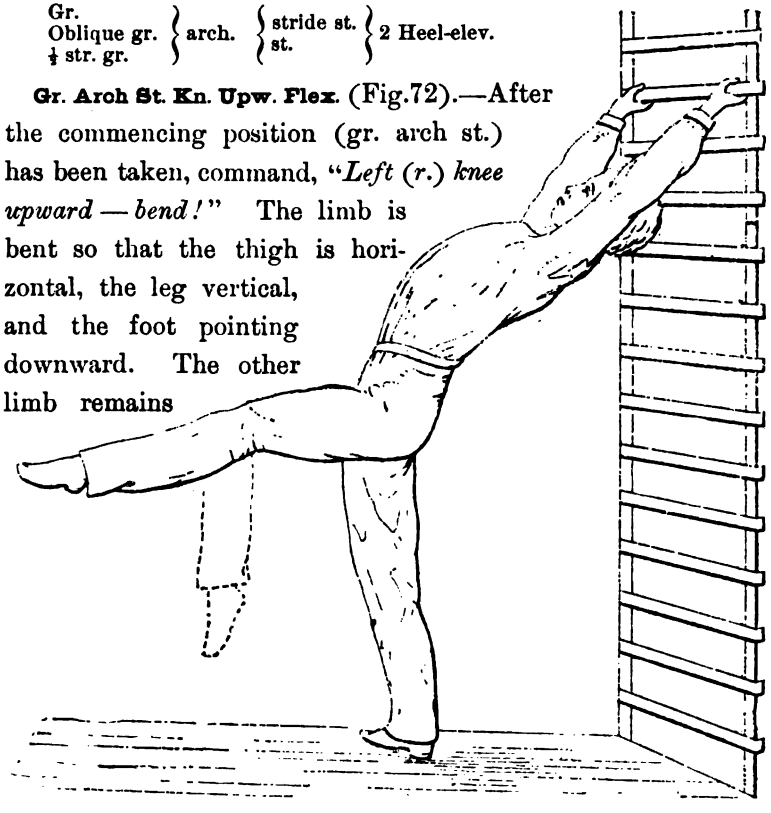


FIG. 73. — GR. ARCH ST. KN. FLEX. AND EXT.

Gr. Arch. St. Kn. Flex. and Ext. (Fig. 73). — Command . . .

"*Knee upward — bend! Knee — stretch! Bend! . . . Change feet — one! Two!*" . . . The knee is stretched as in cr. *a* ½ st. Kn. ext. forw. (see leg-movements). After some practice the

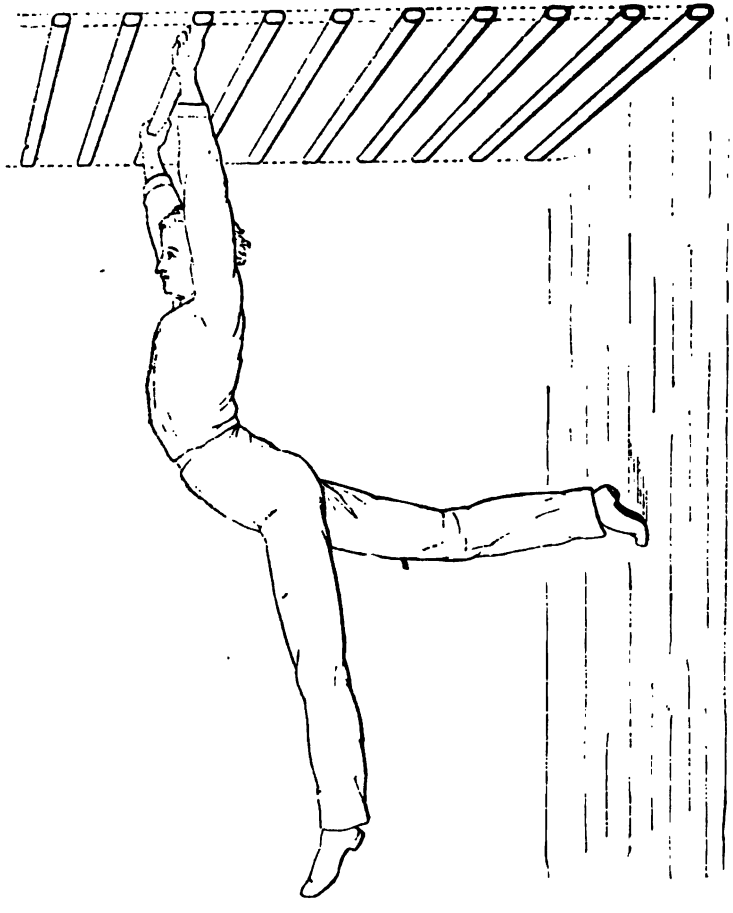


FIG. 74.—GR. ARCH ST. L. AND HEEL-ELEV.; GR. ARCH TOE ST. L. ELEV. FORW.

command will be, . . . "*Knee-flexion and extension, left* (*r.*) *leg — one! . . . Four! Right* (*l.*) *leg — one! . . . Four!*" Done also with oblique grasp, and from toe st.

Gr. Arch St. L. Elev. — Command, . . . "*Left (r.) leg forward — lift!*" With straight knee and extended instep, the leg is raised as far as muscular resistance and good posture will allow. "*Change feet — one! Two! . . . Foot downward — place!*" These movements can be combined with heel-elevation.

Gr. Arch St. L. and Heel-elev. (Fig. 74). — Command, . . . "*Left (r.) leg forward — lift! Heel-elevation — one! Two! . . . Change feet!*" . . . Both of these exercises may also be done with oblique grasp.[1]

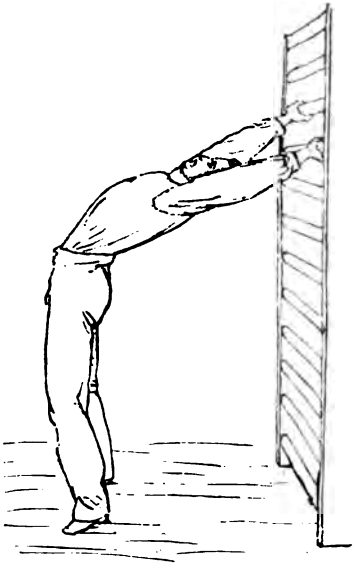


FIG. 75. — OBLIQUE GR. ARCH ST. POS.

Gr. Arch St. Hand Movement Downw. (Fig. 75). — The movement can be done (*a*) so that the hands move to the same bar. Command, "*Hand to hand movement downward — one! . . . Four!*" 1. Left (r.) hand grasps the lower bar. 2. The right (l.) hand is moved to the same bar. 3. The right (l.) hand is moved one bar down. 4. The left (r.) hand follows. "*Upward the same — one! . . . Four!*" takes place in the opposite order. (*b*) The hands skip one bar. Command, "*Hand under hand movement — one! Two!*" . . . 1. The left (r.) hand grasps the next lower bar. 2. The right (l.) hand grasps the bar below the one now held by the left (r.), thus skipping one bar, etc. (*c*) Both hands

[1] In oblique gr. arch st. pos. the lifted knee or leg should correspond to the upper hand. For argument see appendix.

move simultaneously. Command, "*Double hand movement downward — óne! Twó!*" . . . The elbows are slightly bent; and by their rapid extension both hands are pushed from the bar, which they let go in order to grasp the next bar below (or next but one, if so ordered). The movements are easier in stride pos., and best in the latter when the flexion becomes very deep. Flexible individuals, especially children, will (after some practice) be able to move the hands from bar to bar until both hands rest on the floor. This position is called **gr. arch. st. pos. hands on floor** (Fig. 76). A "backward contortionist" easily takes this position free-standing by doing str. stride st. T. flex. backw. downw.[1]

FIG. 76. — GR. ARCH ST. POS., HANDS ON FLOOR.

Gr. Arch St. 2 A. Flex. (Fig. 77). — Command, . . . "*Arms — bend! Strétch! Bend!*" . . . The arms are bent until the head touches the bars, and again stretched, the flexion being slow, the extension a little more rapid. This movement cannot be done in good form unless the trunk is bent to horizontal position, or still farther backward (even until the hands rest on the floor). The same arm-movement is done in stride pos., as well as in the position shown in Fig. 74; and in any of these also with oblique grasp.

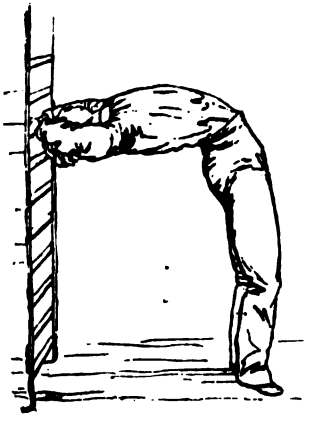


FIG. 77. — GR. ARCH ST. 2 A FLEX.

[1] It is necessary to bend the knees a little, as otherwise the position is impossible.

Stride Fall Hang. to Gr. Arch Stride St. Pos. (Fig. 78). — After the pupils have taken the fall hanging pos., with under grasp (for which see heaving-movements), command, "*Arch standing position — One! Two!*" . . . 1. The feet, which previously rested on the heels, are now put fully on the floor, the body is pushed forward into gr. arch st. pos., the radial border of the hands resting on the bar, the thumbs held apart from the fingers,

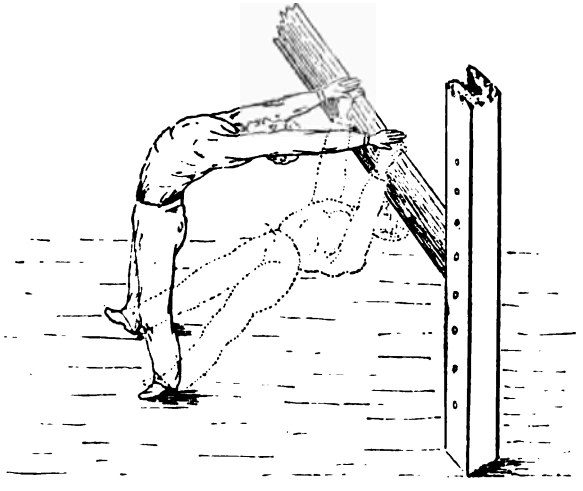


FIG. 78. — STRIDE FALL HANG. TO GR. ARCH STRIDE ST. POS.

and their cushions firmly resting against the bar. 2. Commencing position is resumed by turning the hands over, raising the balls of the feet, and letting the body fall backward. This movement contains the intermediate positions of forward somersault over the bar (see jumping and vaulting), to which exercise it is an introduction. All arch-flexions are increased in strength, not only by changing the movement as above, but also

by increasing the distance from the bars, and by making the backward flexion deeper. A very strong movement can be arranged by travelling sideways, feet on the floor, hands on the bars, the hand and foot of the same side moving together; the movement is called **gr. arch stride st. sidew. trav.**

Small children are seldom able to do a correct arch-flexion on apparatus (or other support for grasp), as they fall backward

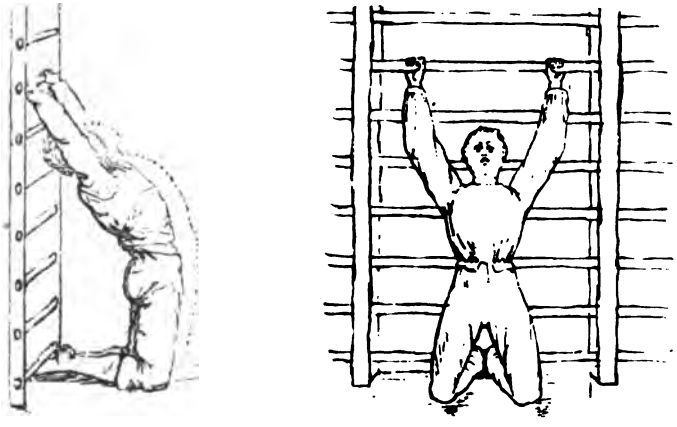
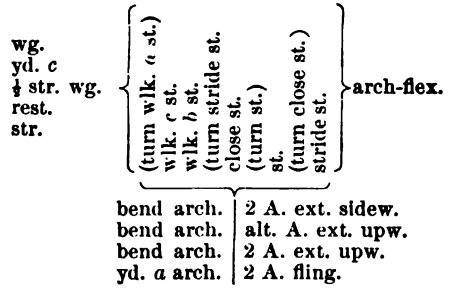


FIG. 79. — STR. GR. STRIDE KNEELING ARCH FLEX.

instead of bending. To correct this tendency, we give them a movement called

Str. Gr. Stride Kneeling Arch Flex. (Fig. 79). — The pupil kneels down in front of the stall-bars with his feet resting against the wall, and his hands grasping as high a bar as he can reach. Command, "*Arch-flexion — one! Two!*" . . . 1. The feet are braced against the wall, and the body arched forward so that the knees rise from the floor. 2. Commencing position is resumed.

Synopsis of arch-flexions: [1] —



yd. *c* arch wlk. *b* st. 2 A. fling. and ch. o. F.
(yd. *c* arch turn wlk. *a* st. 2 A. fling. and ch. o. F.)
bend arch st. alt. A. ext. upw. and F. placing forw.

str. arch. { (turn wlk. *a* st.) / wlk. *b* st } { 2 A. ext., and / change of feet.

Gr.
Oblique gr.
½ str. gr. } arch. {
- stride st. { pos. / 2 Heel-elev.
- st. { 2 A. flex. / Hand trav. downw.
- st. { Kn. upw. flex.
- toe st. { Kn. flex. and ext. / L. elev.

wg.
yd. *c*.
½ str. wg.
rest.
str. } { stride st. / st. } arch-flex. over bar.

Bend arch sup. { stride st. / st. } { 2 A. ext. sidew. / alt. A. ext. / 2 A. ext. } upw.

yd. *a* arch sup. { stride st. / st. } { 2 A. flg.

[1] For progressive list, see Appendix.

HEAVING-MOVEMENTS.

Synopsis:

HEAVING-MOVEMENTS.

- *Aim:* Cultivate contractility of inspiratory muscles. Elevate Chest.
- *Contents:*
  - Introductory. — H. flex. / H. rot.
  - False — 2 A. ext.
  - True — extension. (suspension. / resistance.) / contraction.
- *Types:*
  - 2 A. ext. sidew. / Horiz. trav. — lateral.
  - 2 A. ext. upw. / Vertical trav. — vertical.
  - lateral. / vertical. — expansion.
- *Effects:*
  - Physical.
    - Expand pectoral chest.
    - Internal elevation.
    - Develop muscular arm.
    - Elongate spine.
    - Afflux in thorax and arm.
    - Increase intracardiac pressure.
  - Physiological.
    - Increase respiratory power.
    - Accelerate heart-beat and respiration.
    - Relieve congestion of head and spine.
  - Psychological.
    - Consciousness of power.
    - Repose.
- *Progression:* Mainly Individual.
  - Hang. | Cr. hang.
  - Fall hang. | Stoop hang.
  - Climb hang. | Arch hang.
  - Bal. hang.
- *Limitations:*
  - *Quality:* Proportioned to arch-flex., etc., of same lesson.
  - *Quantity:* Two or more in same lesson.
- *Relations:*
  1. Regulate progression of arch-flex.
  2. Delay use of abdominal exercises.
  3. Can be substituted by shoulder-blade movements and Lat. T. movements.
  4. Merge into
     - arch-flex.
     - shoulder movements.
     - abdominal exercises.
     - Lat. T. movements, etc.

Heaving-movements are exercises cultivating the contractility of inspiratory muscles, and elevating and expanding the chest so as to permanently increase the respiratory power and capacity. These movements are usually exercises of hanging and climbing, the body being suspended from the hands with or without the additional support of one or both legs. Such exercises are called true heaving-movements.

When the body is suspended from the hands a strong tension occurs in those muscles which connect the thorax and arms, especially in the pectorals; that portion of the chest to which these are attached becomes drawn toward the fixed insertion; i.e., the pectoral region rises and expands vertically. If the body is made to swing in a transverse direction, so that the weight is carried by each arm alternately, the thorax will at the same time widen laterally. As the chest expands its vascular capacity increases and a greater afflux occurs toward this region; the intracardiac pressure and heart-beat increase, and respiration is hastened. Secondarily, there is a diminution of blood supply in other parts, the return current from abdomen and legs becoming accelerated.

In hanging from the hands the vertebræ become drawn apart from the sixth dorsal down. The veins of the spine become stretched, and consequently the current through them is hastened (compare slow leg-movements): the position relieves spinal congestion and tends to lessen nervous fatigue. This effect is emphasized by the increased afflux in the arms (caused by the expansion of its muscles), producing a diminution of cerebral blood supply.

The weight of the legs, communicated through the innominate bones is carried by the spine rather than by the muscles of the abdomen (unless the hips are flexed into cr. pos., when the

condition changes), which merely carry the pelvis and determine its angle to the spine. But the upper attachments of these muscles are being spread apart as the ribs are drawn toward the ultimate, fixed insertions in the hands, and consequently the abdominal muscles become stretched from below upward, the arch of the abdomen flattening and driving viscera up (this effect is aided by the thoracic aspiration produced by the position); in this way hanging from the hands becomes a means of internal elevation instead of depression, as supposed by some teachers of former days. But at the same time it is true that if the weight is brought to bear too suddenly a lameness will appear in the epigastric region (superior abdomen or "inferior chest"); this, however, will not take place when a proportionate arch-flexion has preceded the heaving-movement.

All the above effects, which are in a measure passive, become emphasized if the carrying muscles are brought into contraction, as when the arms are flexed, etc.; and now the inspiratory muscles are brought into active play, their power growing by repetition and increase of movement; besides, the muscles of the arm will develop since they are being actively used for the execution of the exercise.

The freestanding-movements of stretching both arms upward, sideways, etc., have effects similar to those enumerated, the expansion of the chest increasing with the speed of movement (in accordance with the laws of penetrating energy), and in absence of apparatus they are used as substitutes for heaving-movements, — false heaving-movements, — and can then be increased in power by changing the position of the trunk (turn, arch), etc., so as to emphasize the expansion of the thorax. 2 A. ext. sidew. would correspond in effect to horizontal and transverse travelling in hang. pos., 2 A. ext. upw. to vertical

travelling. It is to be observed, however, that in the true heaving-movements the upper ends of the muscles are fixed, while in the false the lower are comparatively stationary.

Some chest-weight exercises are to be considered as true heaving-movements. The resistance offered to the contraction of the muscles now is not the body-weight, but is much less, and instead of the body rising toward the hands, the latter descend toward the body. For those having weak muscles, such exercises may form introductions to the heaving-movements on stationary apparatus. It is to be remembered, however, that, unless properly executed, chest-weight exercises are highly productive of bad posture.

If the arms are extended slowly upward, with elbows drawn well back, the *Latissimus dorsi*, *Teres major*, etc., are brought into play, offering resistance to the antagonists, and we have an effect similar to that of the true heaving-movements.

Arm-extensions with loose weights in the hands are not heaving-movements, since they tend to a depression of the superior chest rather than to its expansion. Practised to excess, such movements lead to a vertical compression of the thorax.[1]

The head-movements described among introductions are to be considered as introductory heaving-movements. For the head is connected with the chest by muscles in such a manner that if it is bent backward and then raised with the chin drawn well backward, the sternum becomes lifted through the tension in the sterno-cleido-mastoids; and if the neck is bent sideways and then straightened, the first two ribs become raised by the scaleni. Rotation of the neck will produce similar effects. By repeated practice the muscles will shorten in such a manner as

[1] Women especially get a very dumpy appearance from exercising with iron dumb-bells and like apparatus.

to permanently elevate the fixed point toward which the ribs are lifted at inhalation; and consequently the inspiration will be habitually deeper. It is well said that "the posture of the head determines that of the chest," and, we might add, it decides the depth of respiration.

FIG. 80. — ST. 2 A. FLEX. UPW.; BEND ST. POS.

The true heaving-movements by developing great muscular strength soon produce in the individual a consciousness of power and of its control for slow heavy work. They cultivate repose, and differ in that respect from such movements as vaulting, where it is the executive rather than the poised attention which becomes developed.

The heaving-movements are nearly related to other classes of exercise. So, for instance, lateral trunk-movements, causing an expansion of the chest, can be used as substitutes for them in absence of the necessary apparatus; vaulting on double bar, over bar with rope, etc., have effects in common with heaving-movements; arch hang. pos. is in a measure an arch-flexion; serpentines through ladders, etc., border upon lateral trunk-movements; cr. hang. pos. is partly an abdominal exercise, etc.

The progression of heaving-movements depends largely upon the individual's muscular development, so that men soon become capable of very heavy work, while women, as a rule, will be con-

fined to the lighter types of movement. Exercises where the weight is carried by the legs as well as by the arms are easier than those where the arms alone are involved in the movement.

For advanced classes a second heaving-movement is applied toward the end of the lesson (before the jumping); the second one is then made stronger than the first one, and as different from the latter as possible.

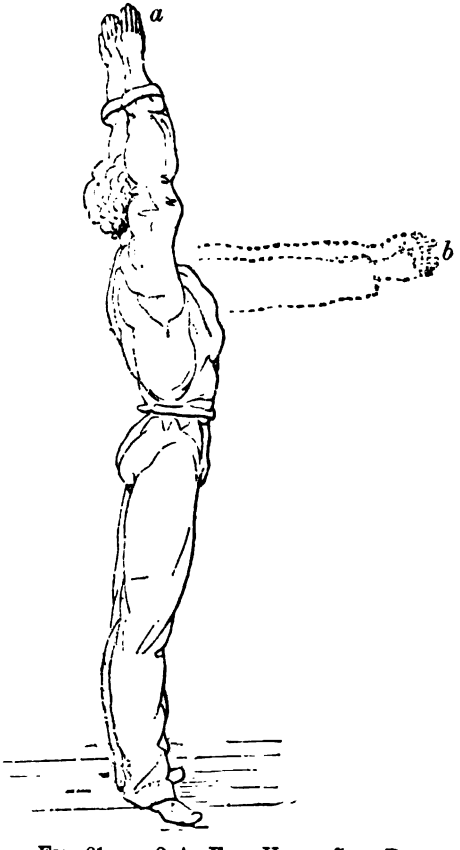


FIG. 81. — *a* 2 A. EXT. UPW.; STR. POS. *b* 2 A. EXT. FORW.; REACH POS.

St. 2 A. Flex. Upw. (Fig. 80). — Command, "*Arms upward — bend!*" The upper arms remain still; with moderate speed the forearms are bent upward as far as possible with the hands semi-closed in front of the shoulders and brought as far sideways as possible. The elbows should be held close to the body. At the command, "*Position!*" the arms resume fundamental position. When the arms are bent upward, the position is called **bend pos.**, and this is the intermediate position of all arm-extensions.

2 A. Ext. Upw. (Fig. 81 *a*). — Command, "*Arms upward*

stretch — one! Two!" 1. Bend pos. 2. The arms are quickly extended upward, so that they are parallel, the palms of the hands turned toward each other,[1] the fingers of each hand held together, and the arms carried as far backward as possible. This position is called **stretch** (str.) **pos.** Common faults are to push the head and abdomen forward.

2 A. Ext. Forw. (Fig. 81 *b*). — Command, "*Arms forward stretch — one! Two!*" 1. Bend pos. 2. The arms are thrust quickly forward; the arms are parallel and horizontal, and the palms of the hands turned toward each other. This position is called **reach pos.** Common faults are to push the shoulders and abdomen forward and to bend the trunk backward.

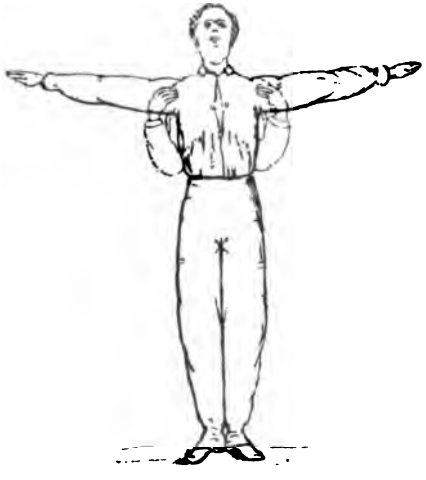


FIG. 82.—2 A. EXT. SIDEW.; YD. *c* ST. POS.

2 A. Ext. Sidew. (Fig. 82). — Command, "*Arms sideways stretch — one! Two!*" 1. Bend pos. 2. The hands are thrust in a straight line sideways from the shoulders, so that the arms become straight, horizontal, and carried well backward, the palms of the hands being turned downward. This position is called **yard *c* pos.** (For other yard positions, see shoulder-blade movements.)

To resume fund. pos. from any one of these positions, command, "*Arms downward stretch — one! Two!*" 1. Bend pos.

[1] If the palms are turned the opposite way, the chest becomes compressed and the head pushed forward.

2. The arms are stretched with moderate speed into fund. pos. As the pupils gain proficiency, the command grows shorter: thus, if at first it is, "*Arms upward stretch — one! Two!*" later on it will be, "*Arms upward — strétch! Two!*" and still later, "*Arms upward — strétch!*"

In absence of apparatus, these movements serve as substitutes for the heaving-movements, and may then (as well as at other times) be done twice or several times in each direction. Otherwise they are used as introductions, and as such form part of every lesson, even for the most advanced classes. A favorite combination for advanced pupils is, "*Twice in each direction, arms forward, upward, sideways, and downward — strétch!*" (or, "*stretch — one! Two! One!*" . . .) For beginners, the reach pos. should be tried last, as it is the most productive of faulty posture; it should always be immediately followed by the yard *c* pos., as this one has the quality of correcting these same faults.

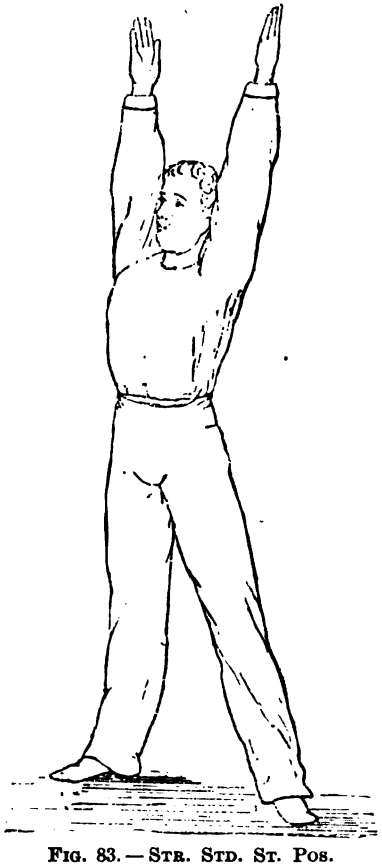


FIG. 83. — STR. STD. ST. POS.

When used as introductions, the 2 A. exts. may be combined with a leg-movement, as, for instance, the str. std. st. pos. (Fig. 83); command, "*Left (r.) foot sideways place and arms upward stretch — óne! Two!*" 1. Bend st. pos. 2. The foot is moved,

and at the same time the arms are stretched as previously described. (Compare leg-movements: std. st. pos. for children; the command is then, "*Feet sideways place and arms upward stretch — One! Two!*" each movement of the arms being accompanied by one foot-movement.) In this manner the various wlk. st. positions can be practised, so that the pupils get some skill in taking the different commencing positions quickly and correctly. These introductions are excellent for the improvement of a child's conception of rhythm and co-ordination of motion. (For other arm-extensions, see shoulder-blade movements.)

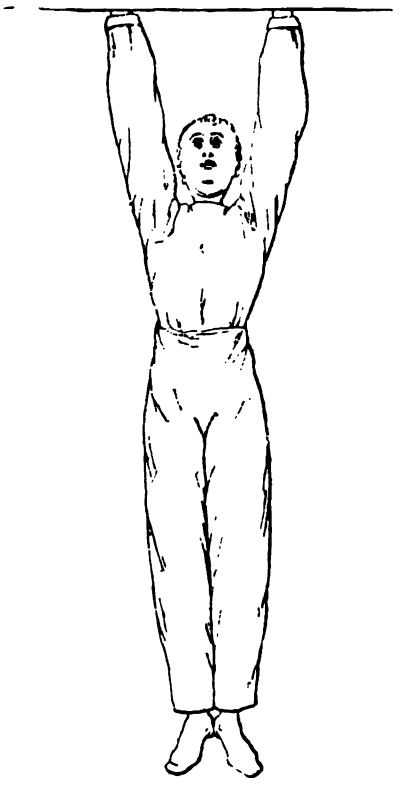


FIG. 84. — OVER GR. HANG. POS.

When hanging by the arms alone from a horizontal bar, we can grasp the latter in three different ways, as follows: —

Under Gr. Hang. Pos. (Fig. 85). — The pupils stand facing the bar. Command, "*Under grasp — grásp!*" The pupils jump, and grasp the bar on the opposite side from that on which they stand. The arms are straight, and the distance between the hands at least equal to the shoulder-width.

If you wish the pupils to grasp on the same side on which they stand, the position is

Over Gr. Hang. Pos. (Fig. 84). — Command, etc., on the same principles as the previous exercise. If one hand grasps each side of the bar, the position is called

Double Gr. Hang. Pos. (Fig. 86), which is done on the same principles. (Best with the groove up.)

When these positions are practised for the first time, the bar is put so low that every pupil can easily reach it, those who are very tall sometimes having to bend their knees slightly backward in order not to stand on the floor after the hands have grasped.

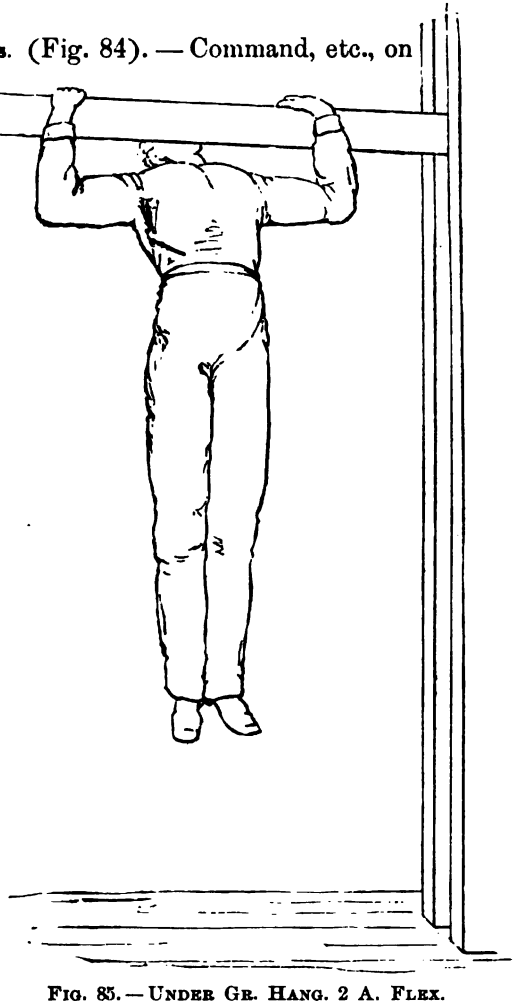


FIG. 85. — UNDER GR. HANG. 2 A. FLEX.

In each one of these positions the pupils may pull themselves up by bending the arms, the exercises being: —

Under Gr. Hang. 2 A. Flex. (Fig. 85). — Command (after commencing position is taken as above), "*Lift!*" With moderate speed the pupils raise themselves as high as possible, the head, elbows, and (straight) legs being carried well backward and the chest forward. At the command, "*Sink!*" the pupils lower themselves slowly until the arms are straight.

Over Gr. Hang. 2 A. Flex., and **Double Gr. Hang. 2 A. Flex.** are done on the same principles. These movements may be increased in strength by increasing the distance between the hands; by bending the arms only to 90°; or by increasing the duration of the movement (by repeating it a number of times). When repeated several times, the movement should not be done by quick jerks, but slowly and evenly, a pause being made in each of the two positions (bend gr. hang. and str. gr. hang. positions).

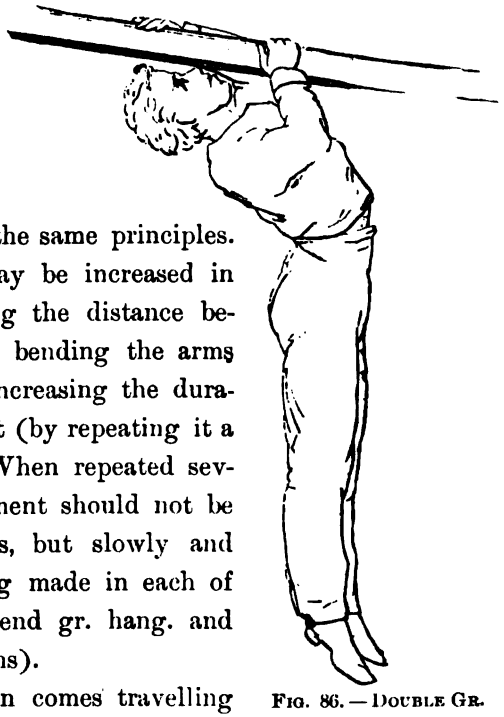


FIG. 86. — DOUBLE GR. HANG. 2 A FLEX., OR UNDER HANG. TRAV.

Next in progression comes travelling on the bar. This can be done in any of the above positions with the arms bent.

Double Gr. Hang. Hor. Travel. (Fig. 86). — Command, "*Start!*" The pupil stands at one end of the bar, grasps it as above, pulls himself up, and travels slowly to the other end by letting each hand alternately grasp behind the other one, the head being kept immediately under the bar ("the nose in the groove!").

The bar may be horizontal or inclined. The movement can be done so that the head is alternately lifted above the sides of the bar, and is stronger in that form. It is then called

Double Gr. Hang. Trav. w. Alternate Elev.

By using either of the other two grasps we get

Und. Gr. Hang. Trav., and

Over Gr. Hang. Trav., which movements are done at first by moving one hand at a time, later on by moving both hands simultaneously ; they are then called

Und. Gr. Hang. }
Over Gr. Hang. } **2 Hand. Trav.**

Beginners (women and children) may travel with straight arms, and the movement then is best done as

Over Gr. Hang. Oscillatory Travelling,

which exercise is done so that the impetus for motion is received by oscillating the whole body (from the shoulders to the feet) from side to side, the left hand moving when the legs swing to the left ; the right when they swing to the right, the distal hand moving first so as to maintain at least shoulder-width between the hands. This exercise corresponds to travelling in the rings (common in American gymnasiums), but is safer and more developing than the latter. Osc. trav. can also be done with und. gr. and double gr., and is then more difficult. Travelling with straight arms without oscillation is harder, and produces more vertical and less lateral expansion.

FIG. 87 *a*. ROTARY TRAVELLING ON THE HORIZONTAL BAR.

One of the strongest horizontal-bar movements is the

Rotary Travelling (Fig. 87). — This movement is done as follows : Grasp the bar with the left (r.) hand, and hang with this arm bent (as shown in Fig. 87 *a*), the right (l.) arm hanging

down by the side; the head is on the side of the bar opposite

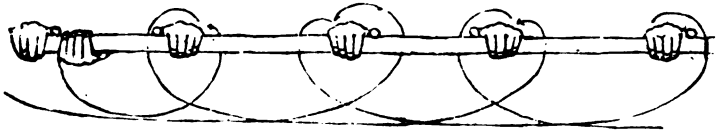


FIG. 87 *b*. — ROTARY TRAVELLING ON THE HORIZONTAL BAR.

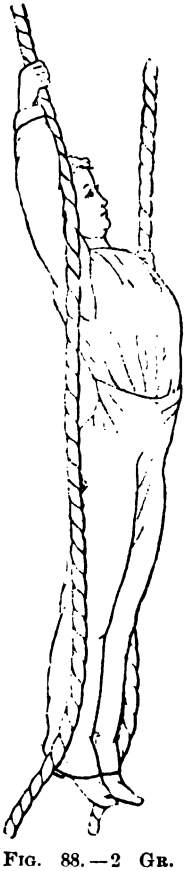


FIG. 88. — 2 GR. HANG. VERTICAL TRAV.

the hand that grasps. Now tip the head backward under the bar, and rotate the body to the right (l.) until the head is on the same side of the bar as the left (r.) hand; grasp with the right (l.) hand, the right (l.) arm bent at the elbow, and let go with the left (r.) hand. Hanging on the bent right (l.) arm, rotate forward to the right (l.) so that the head comes on the original side of the bar, when again grasp with the left (r.) hand, and continue the movement as just described until the other end of the bar is reached. Fig. 87 *b* shows the grasp of the hands, the movements starting with both hands on the bar. If the bar is grasped so that the first rotation takes place forward, it is a little easier to continue the movement.

Travelling by means of the arms alone can also be done upward between two ropes.

FIG. 89. HANG. 2 A. FLEX.

Double Gr. Hang. Vertical Trav. (hand above hand) (Fig. 88). — Grasping two of the vertical ropes, one in each hand, the pupil

pulls himself up as far as possible, extends one arm upward, and grasps the rope a little higher, bends that arm to utmost flexion, and repeats the movement with the other arm, and with each hand alternately until he reaches the ceiling. He travels downward in the same manner or by moving both hands at the same time, — a short distance at a time, and with the arms

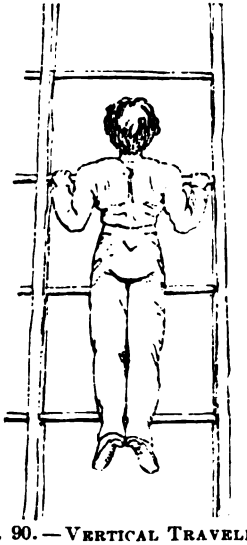


FIG. 90. — VERTICAL TRAVELLING ON PERPENDICULAR LADDER.

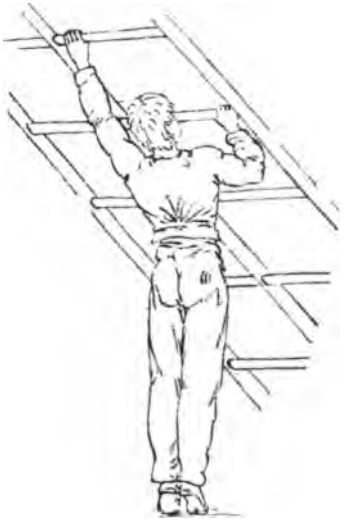


FIG. 91. — OVER GR. HANG. TRAV. ON INCLINED LADDER.

always bent. Before any upward travelling takes place, 2 A. flex. alone (Fig. 89) should be practised; and for advanced pupils this movement may be done two or three times after the ceiling has been reached (or when the pupil has gone as high as he can) before travelling down again.

Figs. 90, 91, and 92 show how a corresponding exercise can be done on ladders and stall-bars, the movement then being done with over grasp.

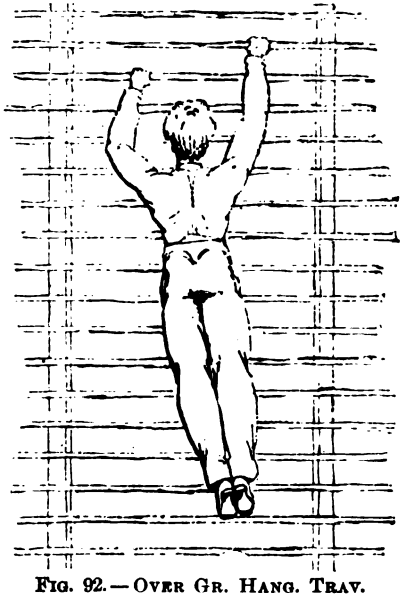


FIG. 92. — OVER GR. HANG. TRAV. ON STALL-BARS.

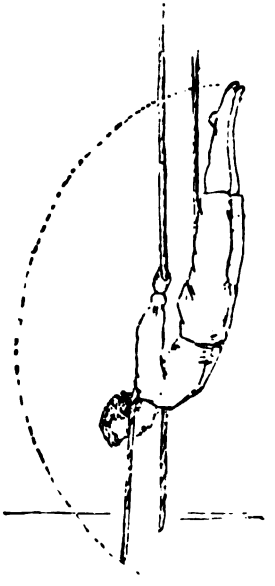


FIG. 93. — SOMERSAULT BACKWARD BETWEEN ROPES.

FIG. 94 *a*. — SOMERSAULT WITH ASSISTANCE.

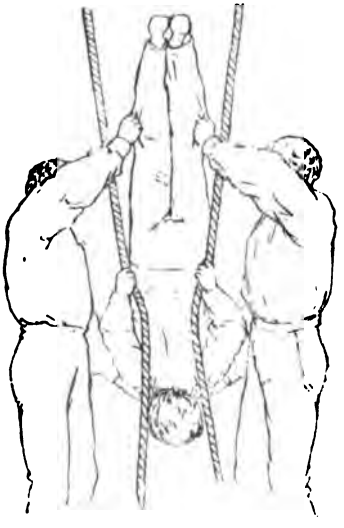


FIG. 94 *b*.

Between the ropes we can also turn a somersault backward, if we hang on straight arms, lift the legs forward upward, and tip the head and shoulders backward, coming back the opposite way. This is called

Somersault Backw. betw. Ropes (Fig.93). — In this movement, skilled athletes are able to hold themselves in horizontal position with upturned face or facing downward (after turning the somersault). Beginners should be assisted as shown in Fig. 94 *a* and *b*. Beginners may be given an introductory exercise on stall-bars, as shown in Fig. 95. Command, "*Forward downward — bend! Grásp! Stoop hanging position — one! Two!*" . . . 1. The legs are lifted so that the whole back of the body rests against the bars. 2. The feet are again put on the floor.

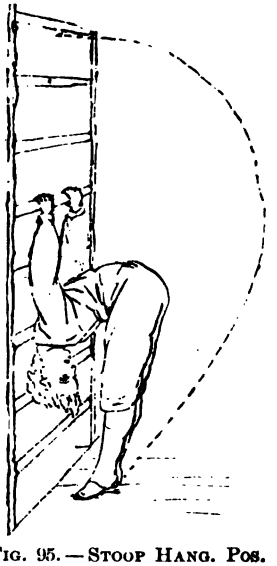


Fig. 95. — Stoop Hang. Pos. on Stall-Bars.

2 Cr. *a* Hang. Pos. (Fig. 96). — The pupil grasps one of the stall-bars (or double or single bar, as in Fig. 96 *b* and Fig. 97) as high up as possible, and hangs on straight arms with his back resting on the bars.[1] Command, "*Knees upward — bend!*" Both knees are bent upward (as in cr. *a* ½ st. pos.). "*Knees downward — stretch!*" The legs are stretched downward again.

Beginners may at first be made to lift one knee at a time. Command, "*Left* (r.) *knee upw. — bend! Change — one! Two!* . . . *Knee downward — stretch!*" 1 = Introduction to cr. hang. 2 = Cr. *a* hang. with the other leg.

[1] This position is called introd. to cr. hang.

2 Cr. *a* Hang. Alternate Kn. Ext. — Command, "*Knees upward — bend! Knee-extension — óne! Twó!*" . . . 1. The left (r.) knee is extended forward so that the leg is horizontal. 2. The left (r.) knee is bent while the right (l.) knee is extended in a similar manner.

2 Cr. *a* Hang. 2 Kn. Ext. (Fig. 97). — Command, "*Knees upward — bend! Forward — stretch! Bend! Stretch!*" . . . Both legs are stretched simultaneously.

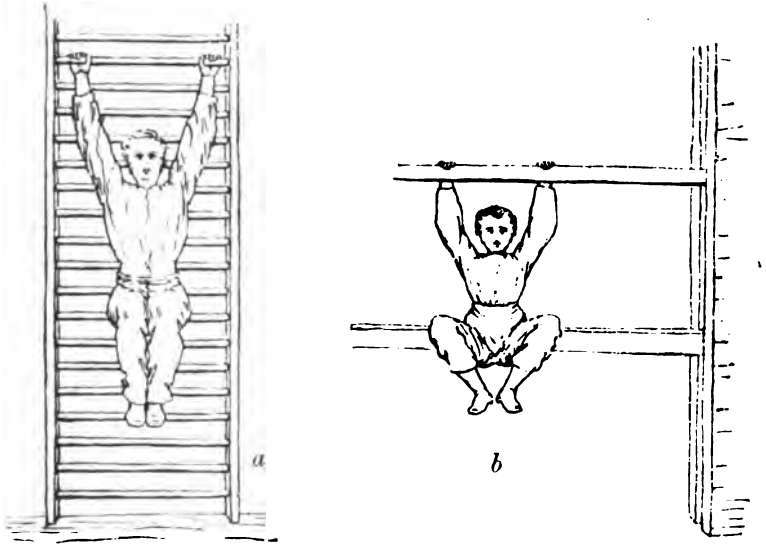


FIG. 96. — 2 CR. *a* HANG. POS. *a*, ON STALL-BARS; *b*, ON DOUBLE BAR.

Cr. Hang. 2 L. Elev. — Command, "*Grásp! Legs forward — lift!*" Both legs are lifted to horizontal position. This pos. is called 2 Cr. *b* hang. "*Sink!*" The legs are lowered. The movement may be preceded by Cr. hang. L. elev.

2 Gr. Hang. 2 L. Swing over Bar (Fig. 98). — Apparatus:

double-bar. Command, "*Grásp!*" The pupil grasps the upper bar. "*Legs forward swing — one! Two!*" . . . The pupil

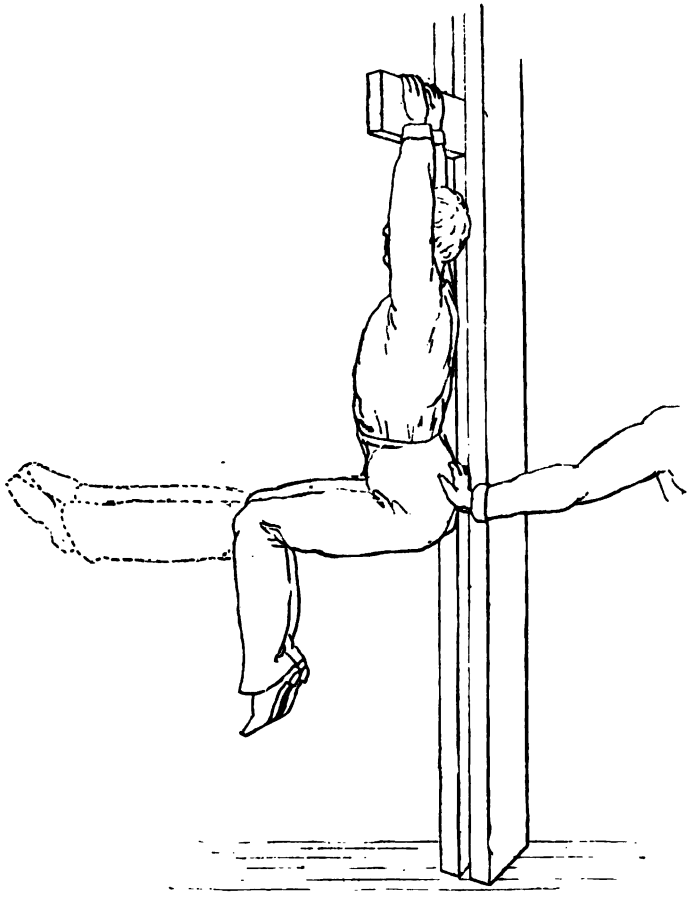


FIG. 97. — 2 CR. *a* HANG. 2 KN. EXT. FORW.

swings his legs straight forward over the bar from side to side.

2 Cr. *b* **Hang. 2 L. Abd.** (Fig. 99). — Command, "*Grásp! Legs forward — lift! Leg abduction — one! Two!*" . . . 1. The

legs are brought as far apart as possible. 2. The legs are again brought together. The legs remain lifted into horizontal posi-

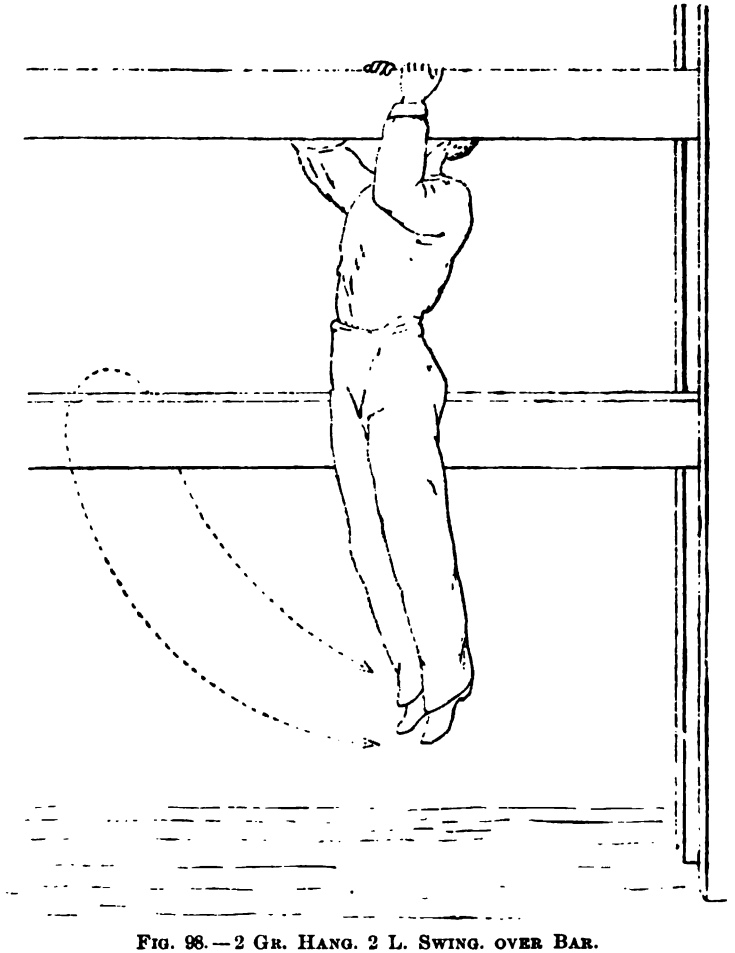


FIG. 98. — 2 GR. HANG. 2 L. SWING. OVER BAR.

tion and the feet are extended throughout the movement.

Later on, the six preceding exercises are done with bent arms (bend 2 cr. hang. pos.).

Over Gr. 2 Cr. *b* Hang. 2 A. Flex. (Fig. 100). — Command, "*Grásp! Legs forward — lift! Arms — bend!* (or *Lift!*) *Stretch!* (or *Sink!*)" . . .

2 Cr. *b* 2 Gr. Hang. Trav. (Fig. 101) is done on the same principles as 2 gr. hang. trav., except that the legs are lifted to horizontal position.

Fig. 99. — 2 Cr. *b* Hang. 2 L. Abd.

2 Cr. *b* Hang. Somersault backw. over the Bar. — The pupil hangs on straight arms, at first with under grasp, later on with over grasp, and lifts his legs forward until his feet touch the bar; now he pulls himself up on bent arms, and, in so doing, throws his legs over the bar (by tipping his head backward),

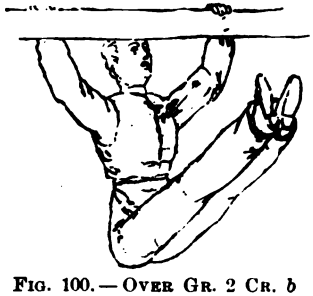


Fig. 100. — Over Gr. 2 Cr. *b* Hang. 2 A. Flex.

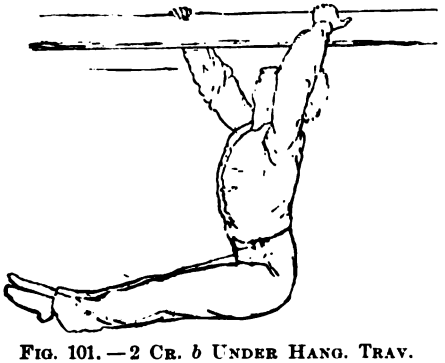


Fig. 101. — 2 Cr. *b* Under Hang. Trav.

tips his trunk backward (Fig. 102), as in the somersault between the ropes, and finally comes wholly over on the other side of the bar on which he rests by his hands. In this position the arms are

straight, the abdomen leans against the bar, the body is gracefully curved backward, and the head is carried high. This position is called

Balance Hang. Pos. (Fig. 103). — Another way of taking this position is to grasp the bar with both hands (over gr.), and with one knee over the bar, to swing the other leg quickly backward, so that one comes up sitting astride the bar; then the forward leg is lifted backward over the bar and placed beside the other one. This movement, called ½ Kn. hang. to bal. ½ sitt. and bal.

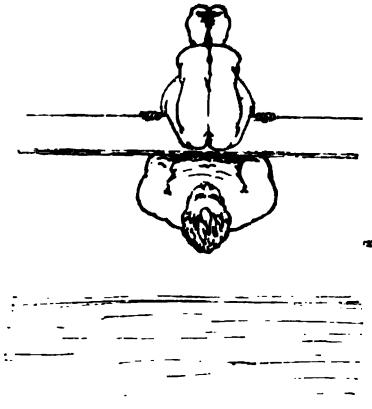


FIG. 102. — INTERMEDIATE POS. OF SOMERSAULT OVER THE BAR.

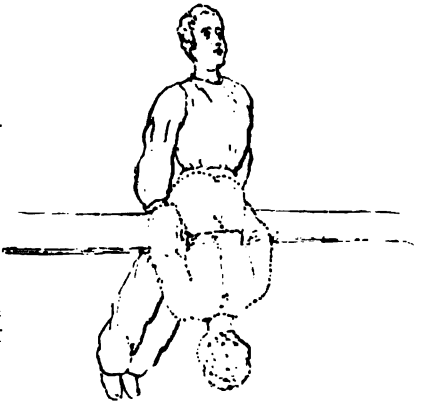


FIG. 103. — BALANCE HANG. POS.

hang., is familiar to all "horizontal-bar performers," and hardly needs illustration. Instead of taking the balance hang. pos. you may bring the backward leg over the bar and sit on the latter (high sitt. pos.). From this position you can now turn a somersault backward, as shown in Fig. 104.

(In a schoolroom the balance hang. pos. can be taken by the pupil standing in the aisle and placing his hands on the desks each side of him; if now he raises his knees forward, the position corresponds to the 2 cr. *a* hang. pos.)

In the balance hang., high ½ sitt. and high sitt. pos. we might travel along the bar, which movements need no description.

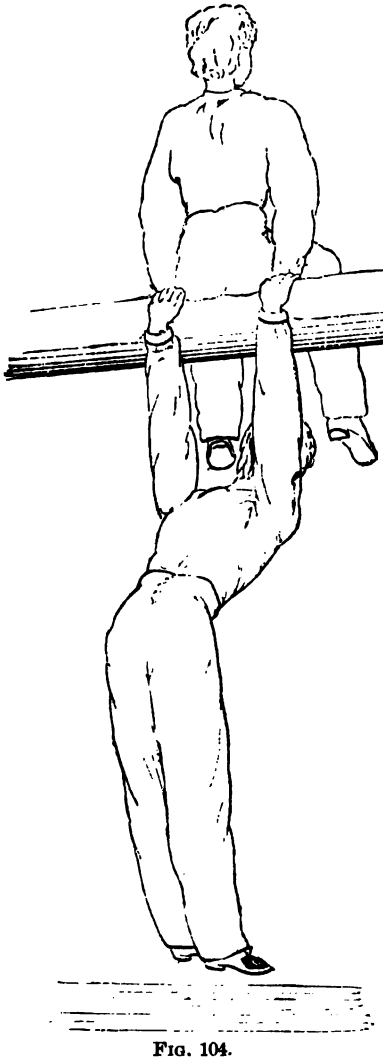


FIG. 104.
HIGH SITT. SOMERSAULT BACKW.

A great many other movements, suitable for advanced pupils, might be done in these three positions, but they will not be described here.

Exercises in cr. hang. pos. are abdominal exercises as well; and, when a heaving-movement of this kind is applied, it usually appears in the last half of the lesson, and the abdominal exercises may be eliminated from that lesson.

Fall Hang. Pos. (Fig. 105). — The bar is put at hip-height. Command, "*Grásp!*" The pupils place their hands on the bar. "*Feet forward — pláce!*" The pupils swing their legs quickly forward under the bar, so that they hang on straight arms with heels resting on the floor. The body is straight from the head to the feet, or slightly arched, the head is back-

ward, and the chest is vaulted. "*Position!*" The pupils resume commencing position. ("*The same — one! Two!*")

Arch Hang. Pos. (Fig. 106). — The bar is nearly shoulder-high. Command, "*Grasp! Feet backward — place!*" The feet are placed as far backward as possible, with the insteps stretched so that the body rests on the tips of the toes. The arms are straight.[1] "*Position!*" etc., as above.

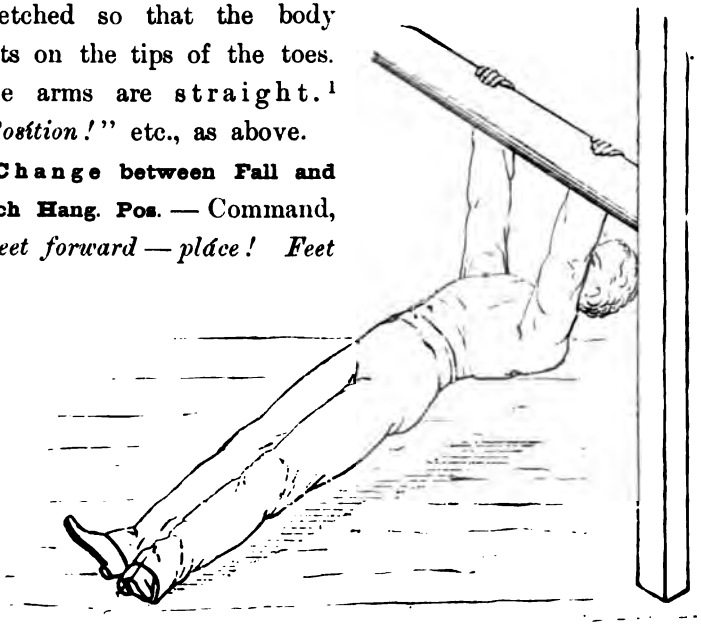


FIG. 105. — FALL HANG. POS.

Change between Fall and Arch Hang. Pos. — Command, "*Feet forward — place! Feet backward — place!*" The arms remain straight while the feet are swung backward into arch hang. pos. "*The same — one! Two!*" . . .

In either position arm-flexion can be done on the same principles as in the other hanging positions. These exercises are called

[1] This position includes the effect of arch-flexion, but is classified as a heaving-movement, since the upper end of the muscles are fixed and the feet form only secondary support, while in arch-flexions the lower ends are fixed and the feet form the chief support.

Fall Hang. 2 A. Flex. and

Arch Hang. 2 A. Flex., and do not need any description.

In either position sideways travelling can be done by moving the hands sideways on the bar and the feet on the floor, opposite hand and foot moving simultaneously. Sagittal trav. can be done from 2 gr. fall-hang. pos. and resembles und. hang. trav., except that the feet drag on the floor or walk in rhythm with opposite hands. These movements, at first done with straight arms, later from bend fall-hang., etc., pos., are suitable as introductions to other hanging positions.

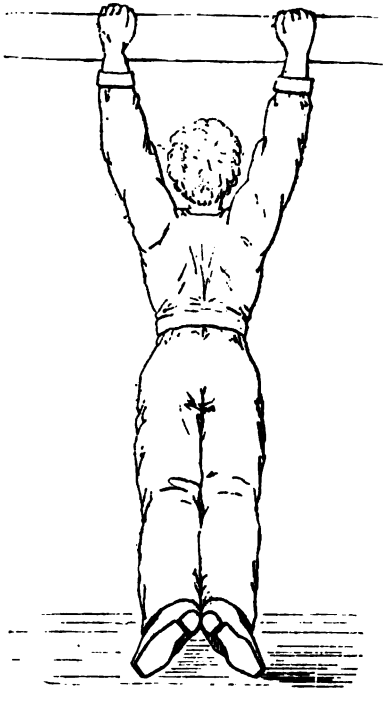


FIG. 106.— ARCH HANG. POS.

All these exercises are increased in force by lowering the bar or by bringing the hands farther apart. In this manner the arch hang. pos. can be made to bring about a most forcible expansion of the chest.

The exercises can be arranged in the schoolroom by placing the pupils in the aisles (facing the back part of the room) and letting them grasp the desks on each side of them.

The following movements are various forms of climbing, which are especially suitable for children, although they should be done by grown persons as well.

Climbing the Inclined Rope (Fig. 107). — The hands grasp the rope, right (l.) hand above, and the left (r.) knee is swung over the rope, while the right (l.) leg hangs straight down. Travelling upward is now done in the following order: The left (r.) hand grasps above the right (l.) one, and then the left (r.) leg is swung off the rope, and the right (l.) one is swung on to it.[1] The same movement is now done with the other hand and leg, and so on till the ceiling is reached. The movement can also be done on the horizontal bar, which may then be inclined. Before travelling is attempted, the movement of the legs should be practised alone, while one hand alternately grasps over and under the other one, which remains

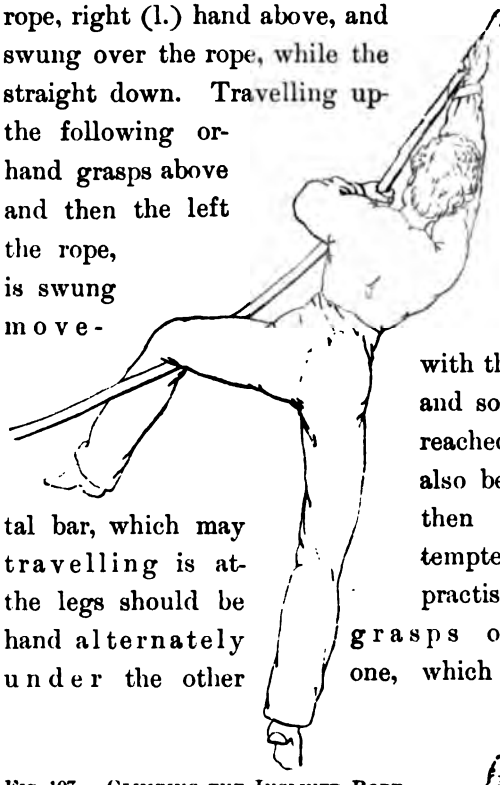


FIG. 107. — CLIMBING THE INCLINED ROPE.

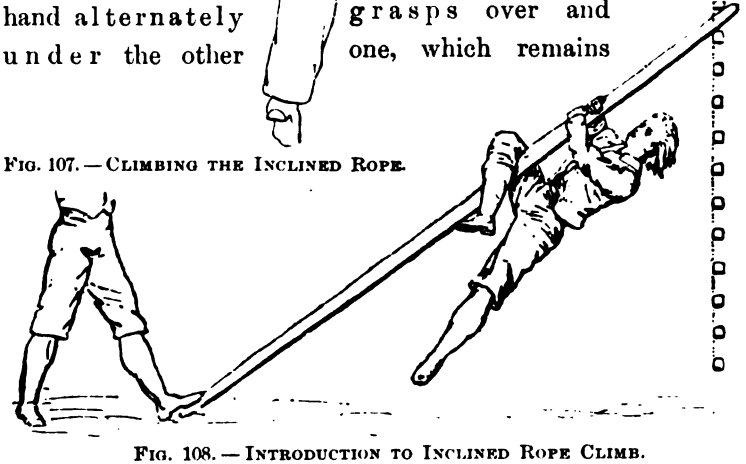


FIG. 108. — INTRODUCTION TO INCLINED ROPE CLIMB.

in one and the same place. For children, this can be arranged

[1] Each limb moves separately: "One, two, three, four" (hand-leg, hand-leg).

by tilting a long bar against the bar-stalls (or into a corner), while another pupil fixes its lower end by placing his foot against it (Fig. 108).

Inclined Rope Climb. Backw. (Fig. 109) is done on similar principles, except that the legs are up and the head down.

Rotary Climb. on Incl. Rope. — Stand under the rope, face turned toward its upper end; grasp 2 gr. with hands near together, and if the right (l.) hand is above swing the right (l.) knee over; now

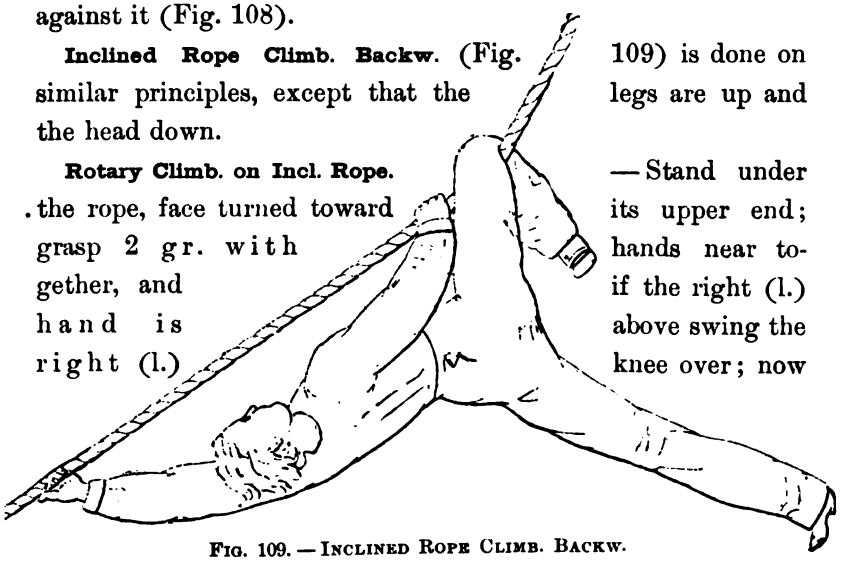


FIG. 109. — INCLINED ROPE CLIMB. BACKW.

move the upper hand above the knee, grasping with und. gr., the other hand following, grasping still higher and from the

FIG. 110 *a*. — 2 ROTARY CLIMBING ON INCLINED ROPE.

FIG. 110 *b*.

same side (pos. of hands is now ov. gr., the previously lower

hand being the higher), swing the knee off, and let the previously free leg swing over the rope above the hands and from the same side as these have grasped. Repeat until the ceiling is reached.

2 Rotary Climb. on Inclined Rope (Fig. 110). — Both hands grasp the rope with over grasp, the body is pulled up on bent arms, and both legs are swung over the rope above the hands (Fig. 110 *a*). Now move both hands, one at a time, upward, and grasp the rope from the opposite side, so that the hand that was below now comes above the other one (Fig. 110 *b*). Repeat the movement of the legs, as above, and continue these procedures as high up on the rope as you can. (Suitable only for strong individuals.)

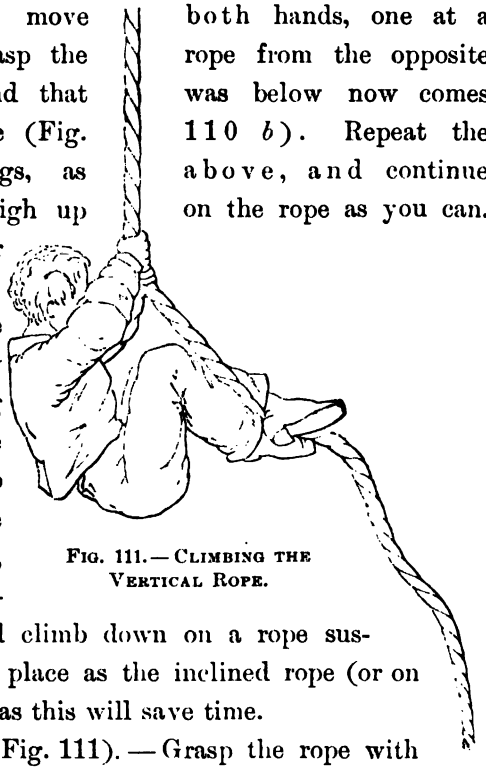


Fig. 111. — Climbing the Vertical Rope.

In each of these movements you may come back by climbing downward on the same principles as you climb up in the first of the exercises. If possible, each pupil, upon reaching the ceiling, should climb down on a rope suspended from the same place as the inclined rope (or on some other apparatus), as this will save time.

Vertical Rope Climb (Fig. 111). — Grasp the rope with the hands, pull the legs up, and take the rope between the feet as near the hands as possible, the left foot being in front when the right hand is uppermost, and *vice versa*. Keeping the grasp with the feet, extend the knees, let the hands glide up as high

as possible, and grasp the rope so that the hand which was below shall now be above the other one. Pull the legs up, and take a new grasp (as above), etc., all the way to the top. To come down, move hand under hand and let the feet slide down the

FIG. 112.—CLIMBING THE POLE.

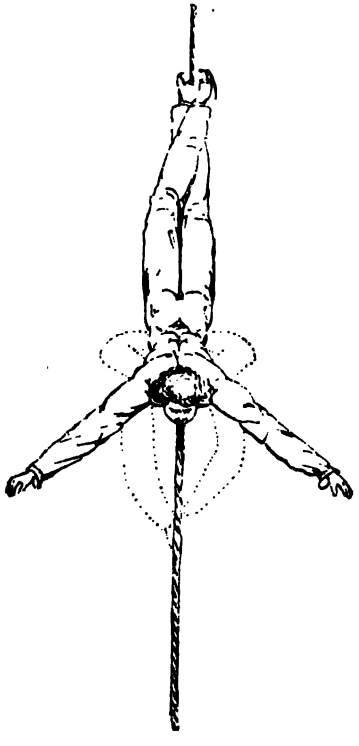


FIG. 114.—SLIDING DOWN THE ROPE, HEAD FIRST.

FIG. 113.—CLIMBING DOWN THE ROPE, HEAD FIRST.

rope, the legs being well drawn up. The movement can be done on the vertical poles as well (Fig. 112).

Instead of coming down as just described, you can descend head first, hand under hand, as in Fig. 113, or by letting the feet slide on the rope, while the arms are extended sideways,

as in Fig. 114. These modes, however, should not be attempted by any but advanced pupils, who, with assistance, have learned how to turn their feet up and grasp the rope, this being done near the floor.

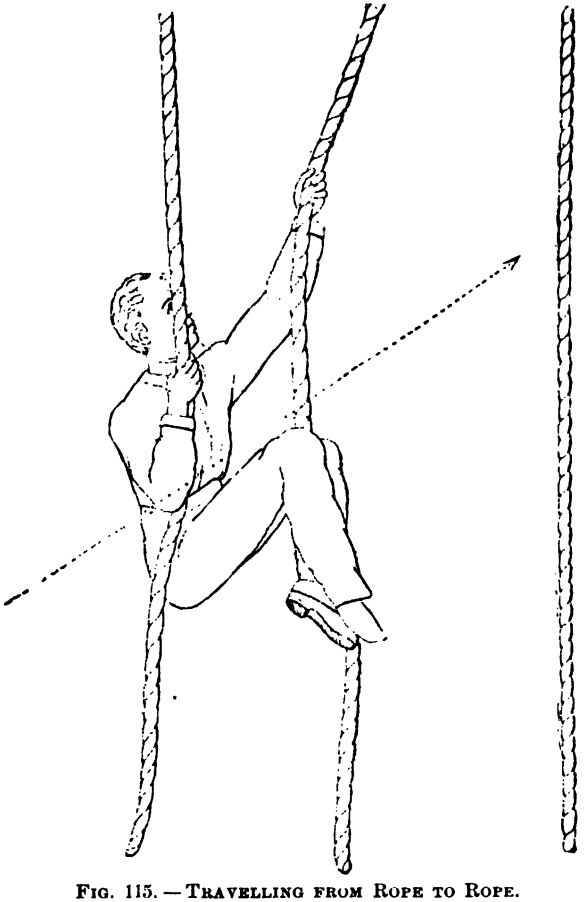


FIG. 115. — TRAVELLING FROM ROPE TO ROPE.

Trav. from Rope to Rope (Fig. 115). If several ropes (or poles) are hanging in a row, the pupils may travel from rope to rope, taking one grasp (and one "lift") on each rope, and

steadily rising. When the ceiling is reached, they travel along on the same level till the last rope is reached, and then slide down in any of the ways described above. (Compare under gr. hang. vertical trav. on ropes.)

Zigzag Vertical Serpentine through Vertical Ladder. — A pupil crawls into one of the openings, and, sitting on one of the rounds, he grasps the next (or second) round above with his

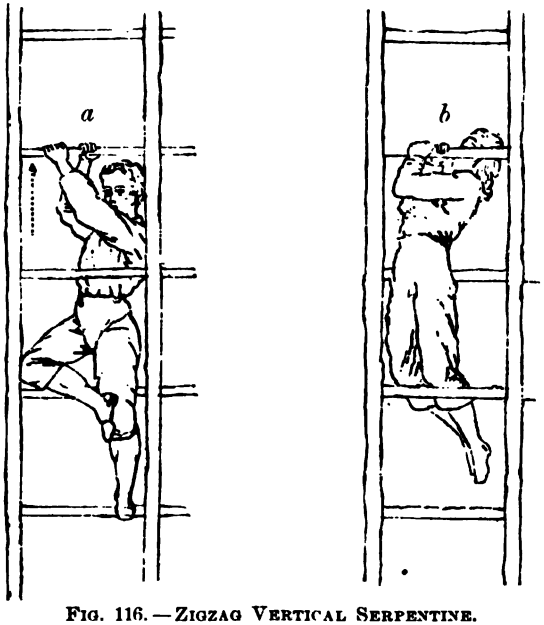


FIG. 116. — ZIGZAG VERTICAL SERPENTINE.

hands crossed; he pulls himself up into the next opening, helping himself by pushing with the feet (Fig. 116 *a*). He now faces the opposite way; and, grasping a round above, as before, he proceeds upward. The rotation should occur alternately to each side; to insure this keep the face turned in the same direction throughout the movement. When he has reached the top of the ladder, he moves into the next opening

obliquely below, and slides down, feet first, in a manner similar to his ascending (Fig. 116 *b*). As soon as there is room, another pupil starts; and in this way a constant current of pupils is kept going up in one half of the ladder and down in the other half.

Another form of serpentine is shown in Fig. 117, where the pupil climbs diagonally from opening to opening, the movement being a little easier than the preceding one on account

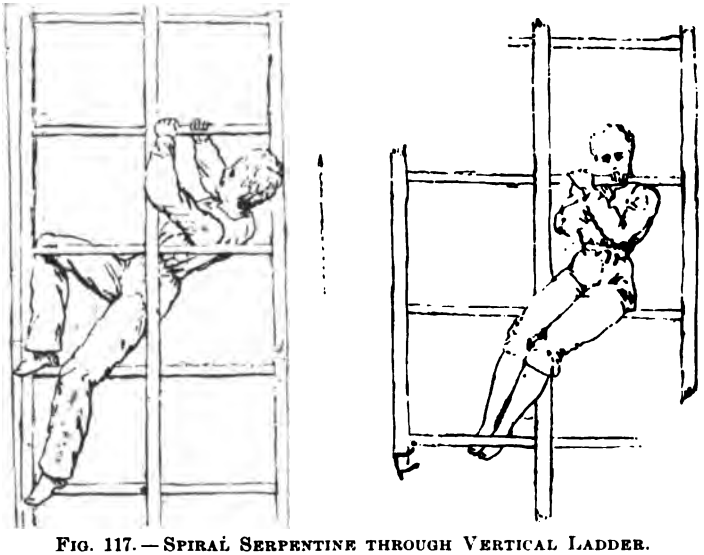


FIG. 117. — SPIRAL SERPENTINE THROUGH VERTICAL LADDER.

of more space. It is usually done so that two pupils sit on the lowest round facing in opposite directions, start at the same time, and follow each other all the way up and down, crawling not only in and out through the openings, but, at the same time also, around each other. This is called spiral serpentine. Care should be taken to make the pupils change places and face the opposite way on alternate days, so as to secure symmetrical development.

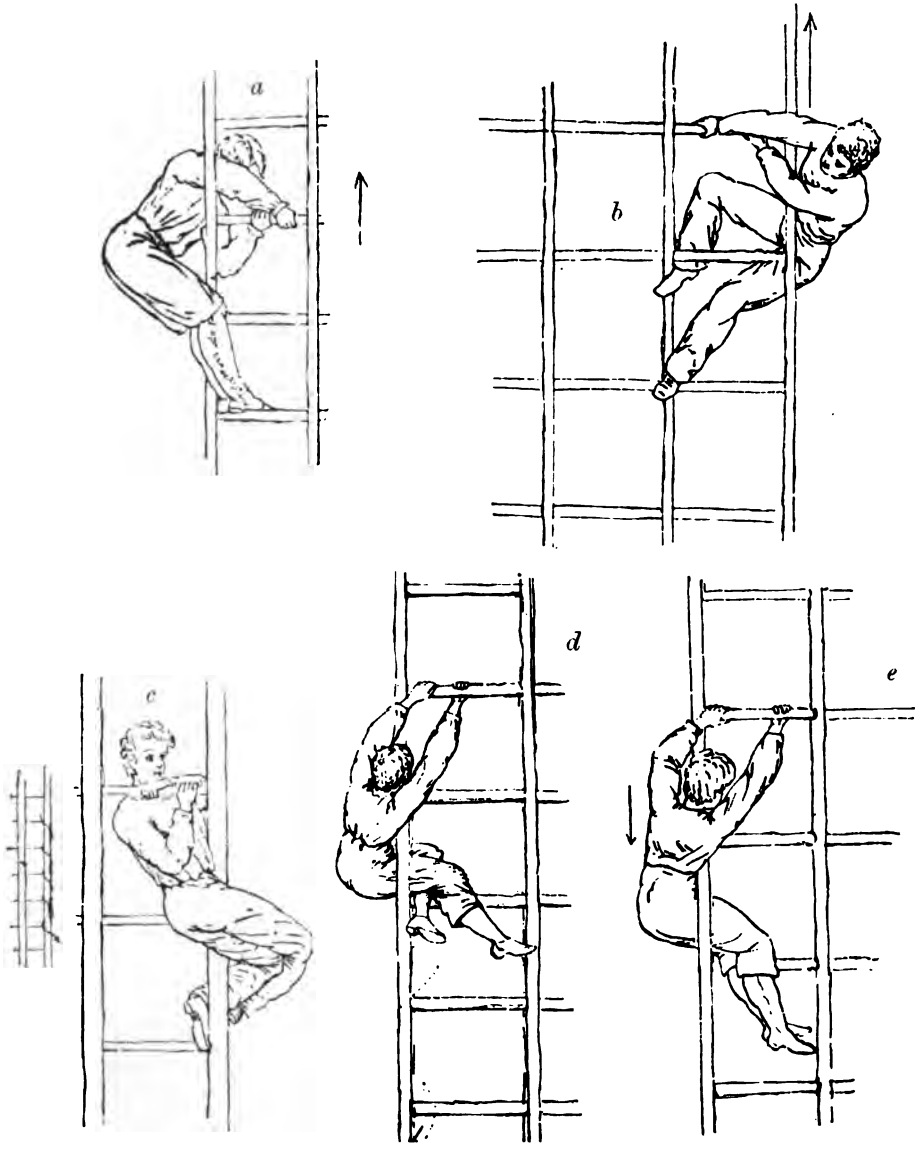


FIG. 118. — OUTSIDE SERPENTINE (AROUND THE SIDEPIECE OF LADDER).

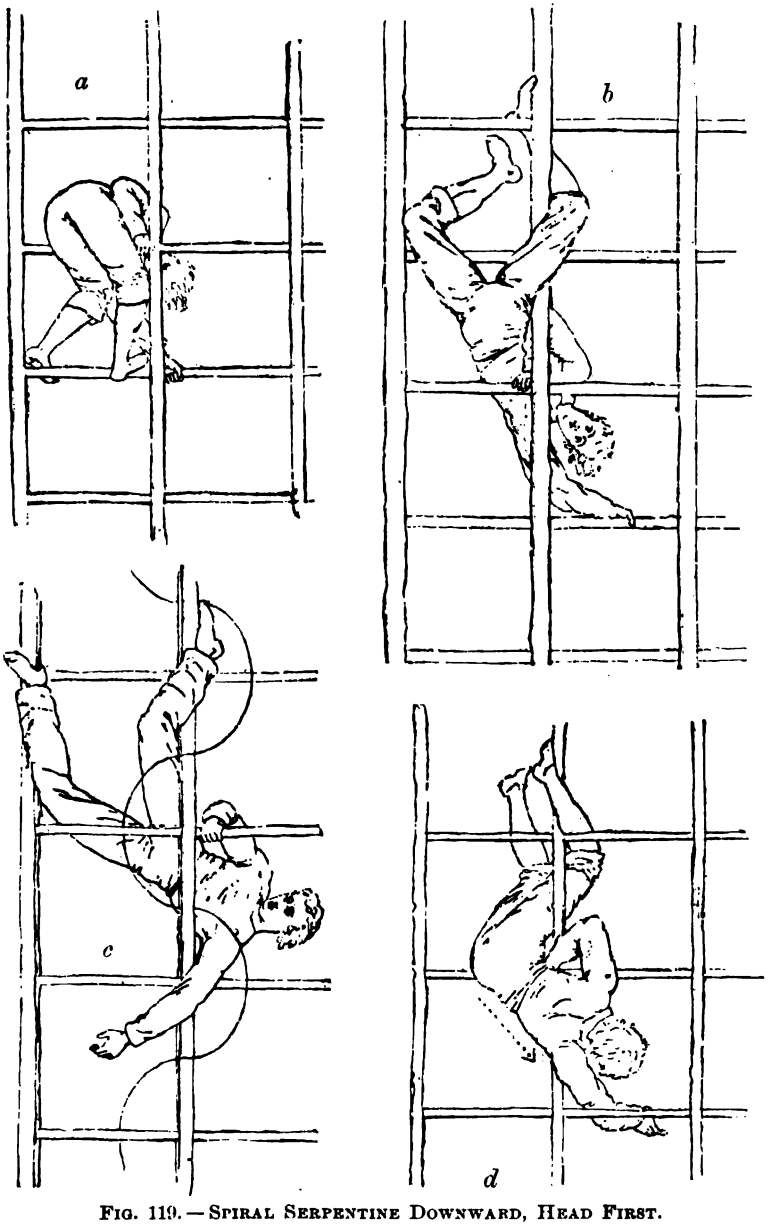


FIG. 119. — SPIRAL SERPENTINE DOWNWARD, HEAD FIRST.

The serpentine can also be done around the side-piece of the ladder, as shown in Fig. 118; *a* and *b* showing the movement upward; *c*, *d*, and *e* downward. You can also slide downward, head first, as shown in Figs. 119 and 120; 119 *a* showing the mode of turning; *b*, *c*, and *d* different stages of the movement. It can also be done by sliding around the vertical without grasping with the hands, the friction of the foot around the vertical preventing a fall, and the outstretched arm (as shown in Fig. 119 *c*, except that the right hand should grasp the left arm between shoulder and elbow instead) guiding the way.

FIG. 120.—OUTSIDE SERPENTINE DOWNWARD, HEAD FIRST.

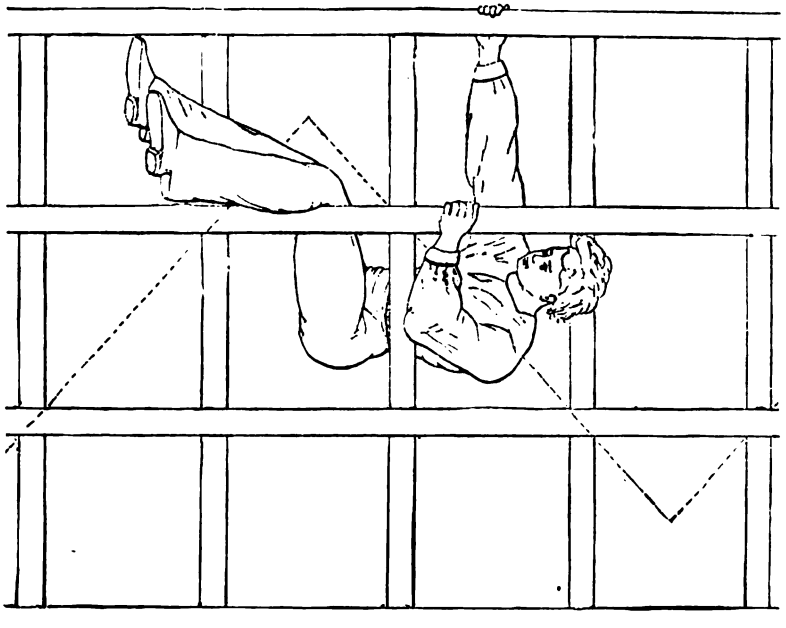


FIG. 121.—DIAGONAL SERPENTINE DOWNWARD, HEAD FIRST.

Of these movements, the second is the easiest, but the first is used more, as it takes less time, if the class is large.

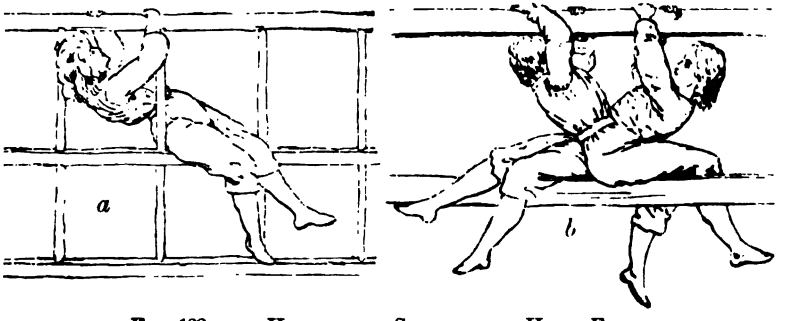


FIG. 122. — *a*, HORIZONTAL SERPENTINE, HEAD FIRST. *b*, CORRESPONDING EXERCISE ON DOUBLE BAR.

The corresponding form of climbing can be done in the horizontal ladder, the motion being similar to that described in the

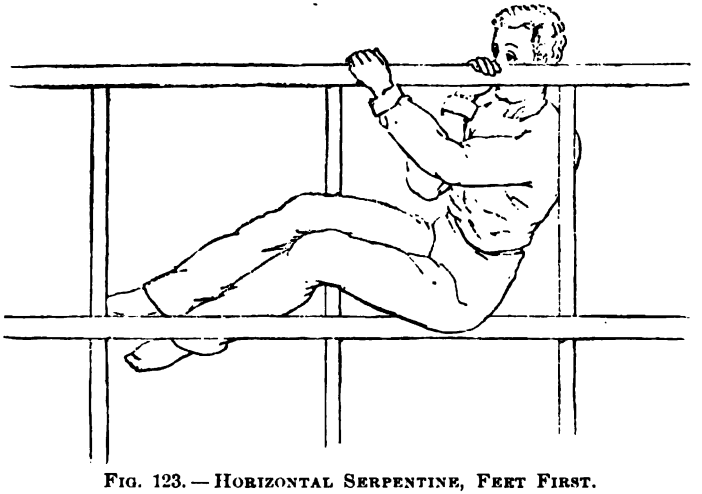


FIG. 123. — HORIZONTAL SERPENTINE, FEET FIRST.

second of the preceding movements. The climbing is done either diagonally, head first upward and feet or head first downward (Fig. 121), or in and out through openings on the same level,

either head first (Fig. 122), or feet first (Fig. 123). In total absence of ladders, a similar movement is done on the double bar, as shown in Fig. 122 *b*, where the pupils climb from side to side around each other. In the horizontal ladder, the pupils can soon travel downward, head first, whereas in the vertical ladder this takes more time to learn. Besides the above serpentines, there are numerous variations of these and also other movements which may be done on the ladders and which hardly need description.

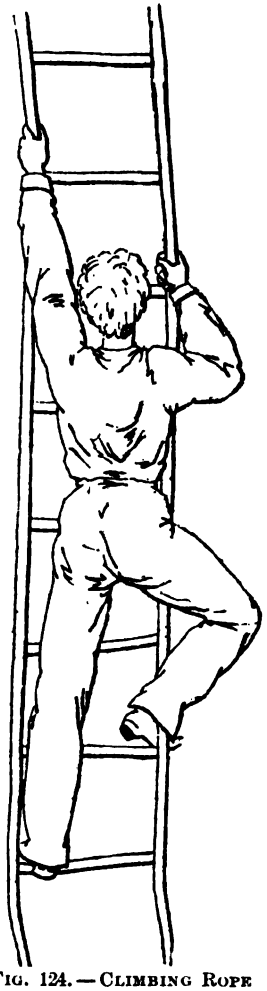


FIG. 124. — CLIMBING ROPE LADDER.

An excellent exercise to cultivate the habit of using the opposite limbs simultaneously we have in the ordinary ladder climbing, as shown in Fig. 124. The command is, "*Upward march — óne! Twó!*" . . . At the start, both feet are on the floor, and both hands grasp as high a round as they can reach (on the rope-ladder the hands grasp the side-ropes); at "*one*," the left foot is moved one step up, and at the same time, the right hand grasps above the left one; at "*two*," the right foot moves one step above the left, while the left hand grasps above the right one, etc. This movement, which may precede all climbing on ropes or poles, is one of the easiest of the heaving-movements. It can be done on ordinary vertical

(or inclined) ladders, on rope-ladders (Fig. 124), and on stall-bars with or without the help of a rope (Figs. 125 and 126).

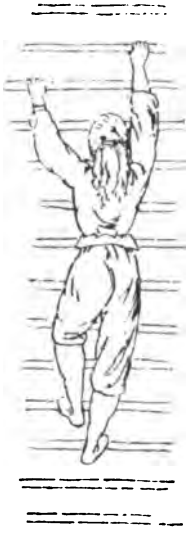


FIG. 125. — CLIMBING THE STALL-BARS.

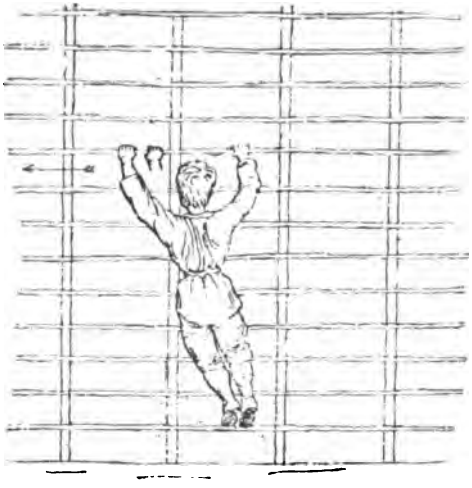


FIG. 127. — SIDEW. TRAV. ON STALL-BARS.

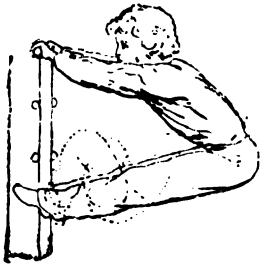


FIG. 128.—REACH GR. COURTESY SITT. 2 KN. EXT.

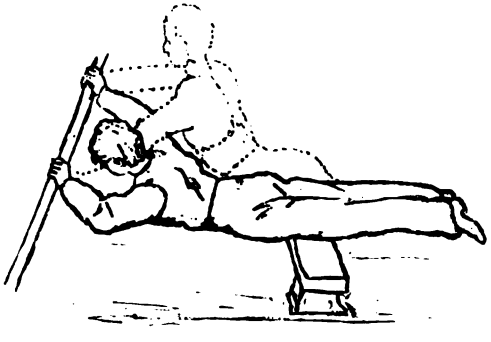


FIG. 129.—REACH GR. FORW. LYING 2 A. EXT.

For children, and in absence of other apparatus than stall-bars, some simple substitutes for heaving-movements can be

arranged, as shown in Figs. 127, 128, and 129, which hardly need explanation.

The sidew. trav. on stall-bars (Fig. 127) can be done in either of two ways; *a*, hand and foot of the same side move at the same time; *b*, the hands move together and the feet together, the movement becoming a sort of jumping.

There is no class of exercises more needed by the growing generations than the heaving-movements, and in any room (schoolroom) some simple contrivance can easily be put up so that at least some form of these movements may be applied.

Synopsis of true heaving-movements classified by commencing-positions: —

Und.	gr. hang.	pos.		
Over		osc. trav.		
Double		2 A. flex. to	bend hang.	
			bal. ½ hang.	
			bal. hang.	

FIG. 126.
CLIMB. LADDER WITH HELP OF A ROPE.

Climb-Hanging.

- Sidew. / Vertical. } trav. on stall-bars.
- Oblique rope or Inclined bar.
  - ch. Leg.
  - trav. H. first.
  - trav. F. first.
  - trav. rotary.
  - trav. 2 rotary.
- Hor. bar.
  - ½ Kn. hang. to ½ sitt.
  - ov. gr. Kn. hang. to sitt. (sit up from "skin a cat").
- Vert. rope. / Vert. pole.
  - Head first. { hor. / vert. / diagonal. } trav.
  - Feet first, vert. trav.
  - Head up; down head first.
  - Feet up; down head first.
- Ladder.
  - Hor. serpentine. { H. first. / F. first.
  - Diagonal serpentine. { H. up, feet down. / H. up, head down.
  - Vertical serpentine. { diagonal. / spiral. / zigzag. / out. spiral. } { *a*, Head up and feet down. / *b*, Head up and head down.

Fallhang. Bend fallhang.

- pos.
- 2 A. flex.
- hor. trav. { transv. / sagittal. } { Hands and feet. / Hands, feet drag.
- vert. trav.[1]
- alt. L. elev. (Fig. 175).

Bal. hang.

- pos.
- trav. { transverse (hor. bar). / sagittal (parallel bars). } { one hand at a time; / both hands.
- 2 A. flex.
- to ½ sitt. (also sidew. trav.) + Somersault forw. or backw.
- to sitt. (also sidew. trav.) + Somersault backw. (or its reverse).

Bend hang.

- und. gr. / ov. gr. { H. rot.
- und. gr. / double gr. (+ vert. trav.). / alt. elev. / over gr. / rotary. } { hor. / diag. } trav.
- double / und. / over } gr. { vert. trav. / 2 hand. { hor. / vert. } trav.

[1] Travel up a rope hand over hand into str. gr. st. pos. from lying on the floor.

Stoop hang.
- pos.
- 2 A. flex.
- Somersault (+ high sitt. Somersault).
- hor. / vert. } trav.
- vert. 2 hand. trav.

Cr. hang.
- introductory pos.
- *a* pos. } one / *b* pos. } both } legs. } pos. / (2) Kn. ext. / 2 A. flex.
- 2 L. elev.
- Somersault. { und. gr. / over gr. / double gr. (ropes).
- 2 L. abd. (from 2 cr. *a* or *b*).

Bend cr. *b* hang. 2 gr. trav. { hor. / vert.

Bend cr. *b* hang. over. gr. hor. trav.

Bend hang. trav. forw. and 2 L. swing. over bar.

Arch hang.
- on upper stall-bar.
- on ropes.
- on hor. bar.
- 2 A. flex.
- vert. trav. (to stand. pos. from lying on floor).
- hor. trav. { transv. / sagittal. } Hands. / Hands and feet.
- L. elev. backw.

SHOULDER-BLADE MOVEMENTS.

Synopsis: —

SHOULDER-BLADE-MOVEMENTS.

Aim: Increase sphere of activity of shoulder-joint and skill of hand.

Contents: Movements of arms with isolation of chest and head.

Types: 2 A. flg. — expansion.
2 A. elev. — localization.

Effects:

- Physical.
  - Correct localization of shoulder.
  - Widening of pectoral chest.
  - Straightening of dorsal spine.
  - Widening of shoulder-girdle.
  - Broadening of back.
  - Equal development of brain-halves.
- Physiological.
  - Improved action of organs in chest and abdomen.
- Psychological.
  - Localization of thought.
  - Concentration of mind.
  - Symmetrical development of faculties.
  - Multiplication of mental power.

Progression:

1. St.
2. Stoop st.
3. Fallout st.
4. Forw. ly.
5. Turn fallout *a*.
6. F. gr. fallout.
7. Hor. ½ st.

Limitations:
Quantity: Two or more in each lesson.
Quality: Expansion before localization.

Relations:
1. Substitutes for heaving-movements.
2. Regulate progression of arch-flexions.
3. Regulate progression of respiratory exercises.

Shoulder-blade-movements are exercises of the arms, usually done in some position producing isolation of chest and head in such a manner that the arms become educated to move independently of shoulder-blade, trunk, and head; in other words, cultivating away the involuntary co-ordinations (inco-ordinations) and the rigidity of this region. The individual who lacks physical culture, as a rule, is "chest bound", i.e., his pectoral muscles have shortened, the shoulder-width has diminished,

the coracoid process is drawn forward, and the shoulder-blade protrudes so that its mobility has lessened. By such movements as 2 A. flg. (sidew. or upw.), a strong tension is brought to bear upon the pectorals: their extensibility gradually increases, and they become longer; the transverse dimension of the clavicular region increases, the collar-bones straightening; and the pectoral region rises; the coracoid process moving backward, the scapula sinks, and its inferior angle flattens on the back. Simultaneously the dorsal spine is pushed forward through the contraction of the trapezii, rhomboidei, etc., acting upon these vertebræ as a system of forces, the resultant of which is sagittal. If these movements — called shoulder-blade-movements of expansion — are followed by movements of localization, like Yd. *d* stoop st. 2 A. elev., etc., the back will widen and give more space for the scapulæ to move over, and besides, these are brought into play in such a manner as to highly increase their mobility.[1] At the same time the arm, in its movements, becomes in a measure independent of the scapula, thorax, and head so that arm-movements no longer produce visible disturbances of posture in these parts. As the chest rises and widens, the organs in it and in the abdomen gain more freedom and better relative positions, their functional activity improving proportionately.

Shoulder-blade-movements of localization require a high degree of muscular isolation, and depend on a precise concept for exactness of execution, consequently they cultivate the ability of associating impulses correctly for motion of some parts during the repose of those adjacent. The power of choosing correct pathways for motor impulses and of inhibiting the

[1] To have the shoulders "drawn back" so as to bring the scapulæ near the spinous processes produces rigidity. A wide back, on the other hand, leads to mobility as well as to strength.

radiation of the latter grows proportionately as the movements become more perfect: the pupil learns how to concentrate his attention and how to correctly localize his efforts of volition.

In the unilateral (½ str. pos., etc.) and bilateral (½ str. yd. pos., etc.) movements, the gymnast is exercising one-half of the brain independently of the other; and by practising the movements equally to both sides, or with an exaggeration on the weaker side, the two halves of the brain (at least as far as motor areas are concerned) may become equally developed, since development will follow exercise, in brain-cells as well as in other parts of the body. It may be possible to accomplish as much without gymnastics; but in study or in abstract thinking there is no proof that one side of the brain is used more (or less) than the other, while in the movements just named it is known as an absolute fact that one side of the brain is used when the opposite limb is put into voluntary motion, and then there is a concrete proof of what is going on in the mind. It is true this effect may be obtained from other movements as well as from shoulder-blade-movements; it is to be noted, however, that a very much closer relation exists between technical skill in hand and arm and mental ability than between the latter and proficiency in other parts; so it might be said that this class of exercise especially emphasizes such effects.

As there is no definite separation of motor, intellectual, and sensory centres, but a majority have a multipolar action, the qualities developed for locomotion will be present for intellection as well, so that the individual who has developed a high degree of unilateral skill physically will possess it mentally too. In that manner the mental capacity is multiplied so that intellectual work is executed not only by the one stronger hemisphere, but as much by the other which now has attained equal

power. The experience in schools where educational gymnastics have been correctly applied, i.e., in accordance with the laws of psychology as well as those of physics and physiology, will bear this statement out as being something more than mere theoretical deduction.[1]

The progression of commencing positions in shoulder-blade-movements is from st. to stoop st. in accordance with the laws of leverage (lever of weight grows longer), and from these to fallout *a*, *b*, *c*, *d*, forw. ly., turn fallout *a*, F. gr. fallout and hor. ½ st. in conformity with the law that movements are easier when the two ends of a muscle are drawn farther apart in the commencing pos., harder when they are brought nearer together, also because the simple precedes the complex. Within each position the progression of the arm-movements is largely dependent on co-ordination, but also in a measure on the law of concentric and excentric muscular activity.

As a rule, it is well to give more than one shoulder-blade-movement in each lesson, their effects being much needed by the average individual. It is well to remember, however, that too many such exercises will overdevelop the trapezius and supraspinatus, so as to make the gymnast round-shouldered from having to carry too much bulk of muscle. No attempts at localization should be made unless the pectoral chest is tolerably extensible, for then the pupils will only grow more round-shouldered as a result of the great antagonistic resistance. If two shoulder-blade-movements are used, they should be made as dissimilar as possible, and are best separated by some other movement like marching; if more than two are used, the additional ones are best placed among the introductions.

[1] Necessarily, while psychology remains in its infancy the psychology of exercise *can* consist of only a few data accumulated by practical experience. Nevertheless such data are procured more easily than any others in psychological research.

Shoulder-blade-movements have many effects in common with heaving-movements, and may consequently be used as substitutes for these when no suitable apparatus is at hand, the movements of expansion being the ones best adapted for such purposes. The progression of arch-flexions depends in a measure on the effect received from shoulder-blade-movements, for a correct arching backward cannot take place, especially with long levers, unless the pectoral chest is tolerably extensible. (In this way it will be found that any class of exercise is dependent for progression upon the advance of other classes as well as upon that of its own types — that is, if development is to be harmonious, and if the "tables" are to be balanced.)

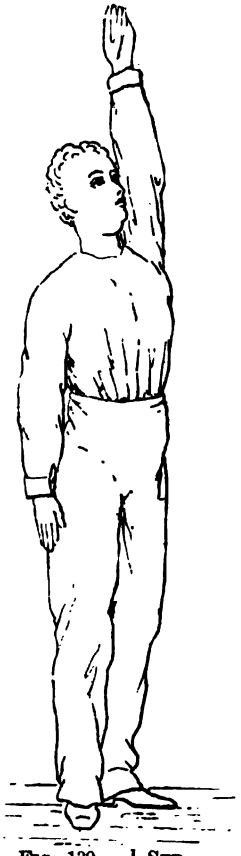


FIG. 130. — ½ STR. ST. POS.

Finally, shoulder-blade-movements determine the progression of respiratory exercises, since the arm-movements of the latter are all borrowed from the former and are not used for respiratory purposes until their co-ordinations have become habitual.

Swinging of Indian clubs or other weights intensifies the effects of shoulder-blade-movements of expansion; lifting of weights may be movements of localization, provided those exercises are applied in their proper progression and with due attention to form and general posture.

Half Str. Pos. (Fig. 130). — Command, "*Left* (*r.*) *arm upward*

stretch — óne! Twó!" 1. The left (r.) arm takes bend pos. 2. The arm is stretched upward on the same principles as when both arms are stretched (in 2 A. ext.). Common faults are: leaning the head against the raised arm, and drooping the other shoulder. "*Change arms — óne! Twó!*" 1. Both arms are bent upward (Fig. 80). 2. The left (r.) arm is extended downward, the right (l.) one upward.

Bend St. Alt. A. Ext. Sidew., Upw., etc. — For children, the movement may be done from bend st. pos. Command, "*Arms upward — bend! Alternate arm-extension upward, beginning by the left (r.) — óne! Twó!*" . . . One arm bends, while the other one extends. In this manner an alternate arm-extension may also be done sideways or forward.

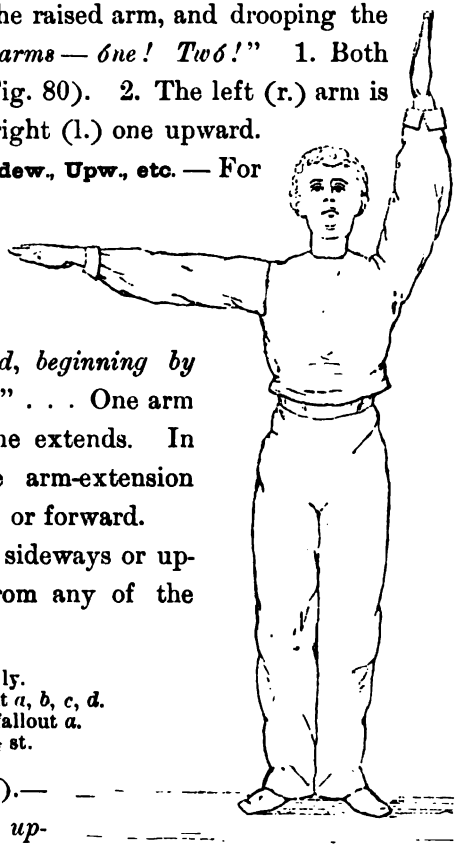


FIG. 131. — ½ STR. YD. *c* ST. POS.

Alternate arm-extension sideways or upward may be executed from any of the following positions: —

st.		forw. ly.
stoop.	stride st.	fallout *a*, *b*, *c*, *d*.
	st.	turn fallout *a*.
	close st.	hor. ½ st.

½ Str. Yd. *c* Pos. (Fig. 131).— Command, "*Left (r.) arm upward, right (l.) arm sideways stretch — óne! Twó!*" 1. Bend st. pos. 2. The arms extend as directed. Common faults are: raising the arm, which is in yard pos., above horizontal, and carrying it forward; leaning the head against the arm, which is extended upward, etc.

½ Str. Reach Pos. — Command, "*Left* (*r.*) *arm upward, right* (*l.*) *arm forward stretch — óne! Two!*" The most common faults in this movement are: stretching the right (l.) arm sideways forward instead of forward, and throwing the same shoulder forward.

½ Yd. *c* Rch. Pos. (Fig. 132). — Command, "*Left* (*r.*) *arm sideways, right* (*l.*) *arm forward stretch — óne! Twó!*" Common faults are: twisting the trunk, throwing the shoulders out of position, and not keeping the arms horizontal.

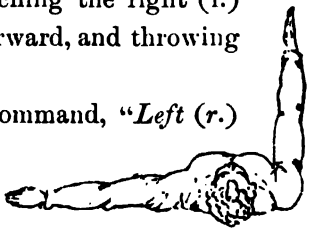


FIG. 132. — ½ YD. *c* RCH. POS.

In the last three exercises the arms change position at the command, "*Change arms — óne! Twó!*" 1. Both arms bend. 2. The arms are stretched in opposite directions. Any of these exercises, even when once learned, will bear repetition on account of their distinct psychological effects; they may then be placed among introductions.

FIG. 133. ST. 2 A. EXT. BACKW.; BACKW. RCH. ST. POS.

The last three exercises may be executed from any of the positions enumerated on page 151.

St. 2 A. Ext. Backw. (Fig. 133). — Command, "*Arms backward stretch — óne! Twó!*" 1. Bend st. pos. 2. The forearms are flung downward and backward as far as good posture will allow, the arms being straight, parallel, and having the palms of the hands turned toward each other. Common faults are: pushing the head forward and concaving the chest. Care should be taken that this exercise not be used too early; for, unless performed in good posture, it has an effect very different from the one desired — which is to expand the clavicular (upper

sternal) region of the chest, thus pushing the shoulder-blades backward. To counteract ill results as well as to increase the good ones, the movement is best combined with (or immediately followed by) 2 A. ext. sidew. Command, "*Arms sideways and backward stretch — óne! . . . Fóur! The same — óne! . . . Fóur!*" . . . This combination is much more powerful than either of the two movements alone, as any one will know who has tried it.

Slow 2 A. Ext. to Yd. *d* **Pos.** (Fig. 134). — Command, "*With palms turned up, arm-extension sideways, slowly — one! Two!*" . . . 1. Bend st. pos. 2. The arms are extended slowly sideways, with the palms of the hands turned upward. Both the flexion and the extension should be done evenly and slowly.

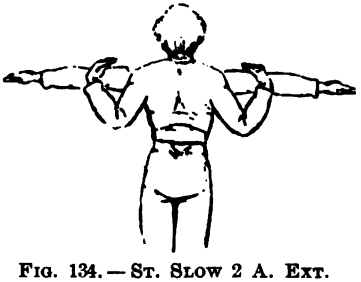


FIG. 134. — ST. SLOW 2 A. EXT. TO YD. *d* POS.

Slow 2 A. Ext. Upw. — Command, "*Arm-extension upward, slowly — one! Two!*" 1 = Bend pos. 2 = The hands and wrists extend, and with vertical forearms, the arms are stretched slowly upward, the elbows being drawn well back throughout the movement. The return to bend pos. occurs as slowly and in a similar manner, the wrists and fingers being the last to flex. This movement is usually applied as a heaving-movement, but has the effect of shoulder-blade-movements as well, and hence is preferably used as such when bars and other apparatus is at hand. (The last two movements are not suitable for small children.)

Yard *a* **2 A. Flg.** (Fig. 135).[1] — Command "*Arms forward —*

[1] Yard positions are: (*a*) arms forward bend (Fig. 135); (*b*) arms horizontal, elbows at right angles, upper arms pointing sideways, forearms forward, and hands turned with palms toward each other; (*c*) arms extended sideways, palms turned

bénd!" The arms, bent at the elbows, are lifted sideways to horizontal position with the elbows well drawn backward, the palms of the hands turned down, the forearm and hand in a straight line, and a little below the level of the shoulder. This is the yard *a* pos. (Fig. 135 *a*), which should be practised alone before any arm flinging is done. The hands must not touch each other or the chest (as described by a recent German author), as that would bring the elbows forward and lessen the expansion of the chest. The movement, done from this position, is, "*Arm-flinging* (or *Arms sideways fling*) — *óne! Two!*" . . . 1. The forearms are flung quickly sideways to yard *c* pos. (arms horizontal,

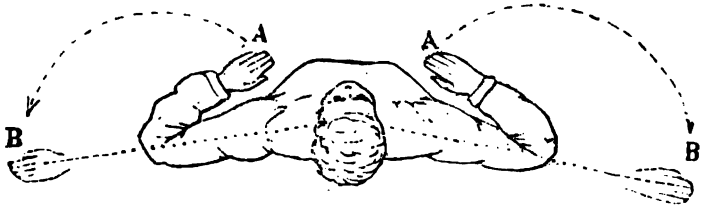


FIG. 135. — YD. *a* 2 A. FLING.

palms turned down) (Fig. 135 *b*). 2. With moderate speed (so that they may not strike the chest) the arms resume yard *a* pos.

Rch. St. 2 A. Flg. Sidew. — Command, "*Arms forward — strétch!* (see heaving-movements). *Arm-flinging sideways — óne!! Two!*" . . . 1 = The straight arms are flung with utmost speed into yd. *c* pos. (arms horizontal; straight; palms down). Common faults are: pushing the abdomen and head forward, and inclining the shoulders backward. 2 = With moderate speed the arms return into rch. pos.

down: (*d*) arms extended sideways, palms turned up (Fig. 141); (*e*) upper arms horizontal, elbows at right angles, forearms vertical, and palms turned toward each other (Fig. 137).

Rch. St. 2 A. Flg. Upw. (Fig. 136). — Command, "*Arms forward — strétch! Arm-flinging* (or *Arms upward fling*), — *óne! Two!*" . . . 1. Remaining straight, the arms are flung quickly upward into stretch st. pos. 2. With moderate speed, the arms are lowered into reach pos.[1] A common fault is to push the head forward when the arms rise. To counteract this, beginners may do the movement with the head bent backward. Command, "*Arms forward — strétch! Head backward — bend! Arm flinging — óne! Two!*" . . . (The effect may be emphasized by combining the movement with L. elev. backw. Command, "*Arm flinging upward, leg-elevation, backward — óne! Two! Thrée! Four!*" . . .)

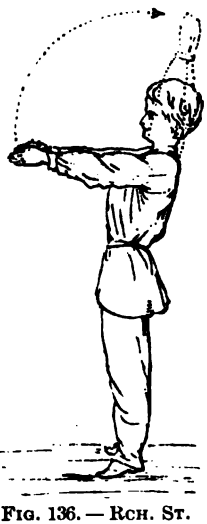


FIG. 136. — RCH. ST. 2 A. FLG.

Beginners find it difficult to return to the reach pos. without lowering the arms below horizontal; for this reason the arm flinging may at first be done from fundamental position (st. 2 A. fling. upw.). For children it may be still more simplified by flinging each arm alternately from fundamental position, one arm being flung up, while the other moves down.

Arm flinging upward can also be done from yard *b* pos.

Yd. *b* 2 A. Flg. [**to Yd. *e* Pos.**] (Fig. 137). — Command, "*Arms half forward — bénd!*" This is yard *b* pos., in which the arms are horizontal, elbows bent at right angles, and on a level with the shoulders, palms turned toward each other, forearms parallel and pointing forward. The movement to be done from this position is, "*Arm flinging — óne! Two!*" . . . 1. The

[1] The effects of the last two movements become highly emphasized, when done with dumb-bells or other loose weights, these adding penetrating energy to the swinging pendulums, and hence increasing the tension in the pectorals.

upper arms remain horizontal, while the forearms are flung upward until they are vertical (or carried still more backward, if possible). 2. With moderate speed, the forearms are lowered into yd. *b* pos.[1] When this movement is done for the first time the pupils may be allowed to lean against a horizontal bar (as shown in Fig. 137). In this way better muscular isolation is attained. The movement, simple though it appears, is exceedingly difficult to do correctly, and consequently it can be applied only to advanced pupils — seldom to children.

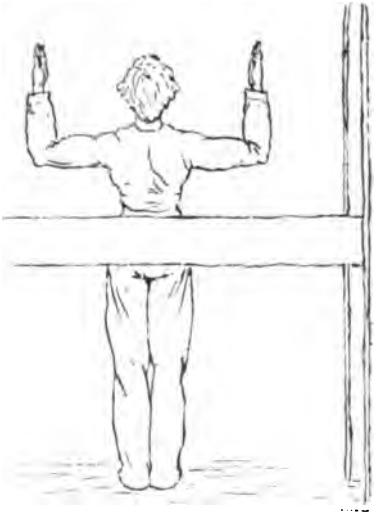


FIG. 137. — YD. *e* SUPPORT ST. POS.

The exercises from 2 A. ext. backw. onward may be executed in any of the positions enumerated on page 151.

Yd. *c* 2 A. Flg. Forw. — Command, "*Arms sideways stretch — one! Two! Arm flinging forward with turning of the hands — óne! Twó!*" . . . 1. The forearms are slightly lifted, and while the hands are turned, palms up, the arms are flung sideways forward into rch. pos. (with palms up). 2. The forearms are lifted, and the hands turn, while the arms are flung back into yd. *c* pos. The movement resembles cutting the air with two swords. The most common faults are: pushing the head forward, when the arms are flung backward, and bending the arms so much that the movement resembles an arm-extension, the line of motion being a straight line instead of a curve.

[1] It would be more correct to name the movement yd. *b* 2 A. rot.

Stoop Pos. — (For command, etc., see arch-flexions.) In this position the extensors of the back are forcibly contracted, and thereby the shoulder-blades are drawn downward and flattened, so that the position becomes one of localization. Besides, the trapezius, rhomboidei, etc., now become more forcibly used to retain the commencing pos. (the lever of the weight having grown longer), so that less of their energy is left for the execution of the movement.

FIG. 138. — WG. STP. STD. ST. H. ROT.

FIG. 139. — BEND STP. STD. ST. POS.

To keep the pupils busy while standing in this position, a head-rotation may be ordered.

Wg. Stp. Std. St. H. Rot. (Fig. 138). — After the position is taken, command, "*Head rotation, to the left (r.), right (l.), and forward — óne! Twó! Thrée! The same right (l.), left (r.), and forward — óne! . . . Threé!*" etc. The H. rot. is done from

wg. / yd. c. { stoop { std. st. / st. / close st. } / forw. ly. } pos.

2 A. Ext. Upw. When done from any position where the trunk is inclined forward, this movement becomes a shoulder-blade-movement. Under such circumstances, when done for the first time, the arms should be stretched upward before the trunk is bent forward, as this favors the muscular action (excentric); later the movement is begun from bend pos., this being a little more difficult. Similarly Reach 2 A. flg. upw. and Yd. *d* 2 A. elev are at first done from Str. pos. as commencing pos., the first motion then being excentric. This is indicated in the tables by inserting the abbreviation exc. before the words flg. elev., etc., as for instance in Reach stoop st. exc., 2 A. flg., which later becomes Rch. stp. St. 2 flg., etc. Suitable shoulder-blade-movements are also 2 ext. sidew. to Yd. *c* or Yd. *d* pos. from some position of inclined trunk; also the movement of Yd. *c* 2 A. rot. (Command "*hands — turn! Two!*" . . .) and 2 A. swim. (See Appendix. Introductory Swimming Exercises.)

2 A. Circ. — Command, . . . "*Arms sideways — lift! Arm circumduction — stárt!*" The arms remain straight, and are moved with moderate speed so that the hands describe a small circle upward, backward, downward, and forward, and this is continued until the command "*Stóp!*" is given; also

Yd. *d* 2 A. Elev. (Fig. 141). — Command, . . . "*Arms sideways — strétch! Hands — túrn! Arm-elevation — one! Two!*" . . . 1. The arms are slowly raised sideways into str. pos. 2. The arms resume yd. *d* pos. equally slowly. When done from str. pos., the command is, "*Arms sideways sink! Arms lift! — The same — one! Two!*" . . . For advanced pupils it may be changed to

½ Str. yd. *d.* 2 A. Elev., in which movement one arm is lifted, while the other is lowered, so that the hands maintain the same distance from each other as in the commencing position.

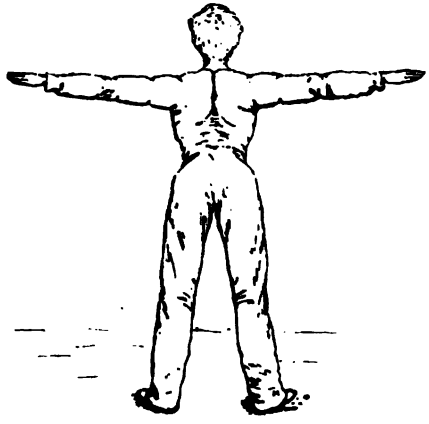


FIG. 140. — YD. *c* STP. STD. ST. POS.

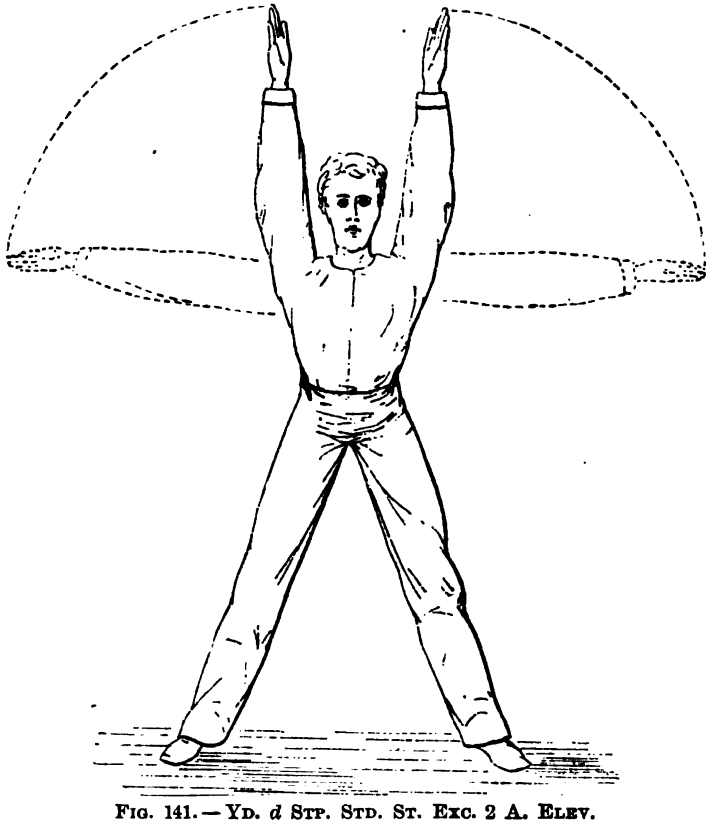


FIG. 141. — YD. *d* STP. STD. ST. EXC. 2 A. ELEV.

(The force of the movements of 2 A. ext. and 2 A. elev. may be increased by adding dumb-bells or other loose weights.)

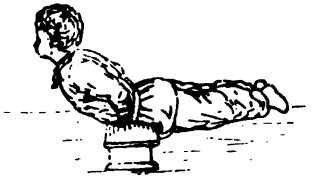


FIG. 142. — WG. FORW. LY. POS.

Forward Lying Pos. (Fig. 142). — The pupil lies face down across a bench so that his waist is over the middle of the bench; his legs are straight, and his feet and hands rest on the floor. At the command "*Hips — firm!*" he places his hands on his hips, and raises his trunk as high as he can, his feet leaving the floor so that he balances on the bench. At the command "*Position!*" he resumes commencing position. When movements are to be done with this for a commencing position, the legs of the pupil are prevented from rising above horizontal, by another pupil kneeling behind and grasping the first one above and around the ankles (as in Figs. 143 and 144). In a school-room this has sometimes been done so that the pupil lies down on the desk, and places his feet under the cross-tree of the back rest of his chair.

Besides movements already enumerated from this position, we also have

wg.
Yd. *c*
¼ str. wg. } forw. ly. T.
rest } backw. flex.
str.

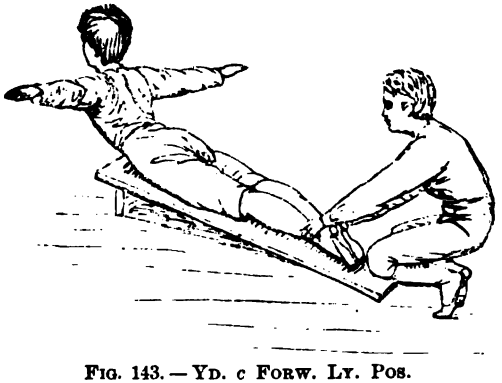


FIG. 143. — YD. *c* FORW. LY. POS.

In these, after commencing position is taken, the command is, "*Trunk forward — bend!*" when the pupil bends until he touches the floor; and "*Trunk backward* —

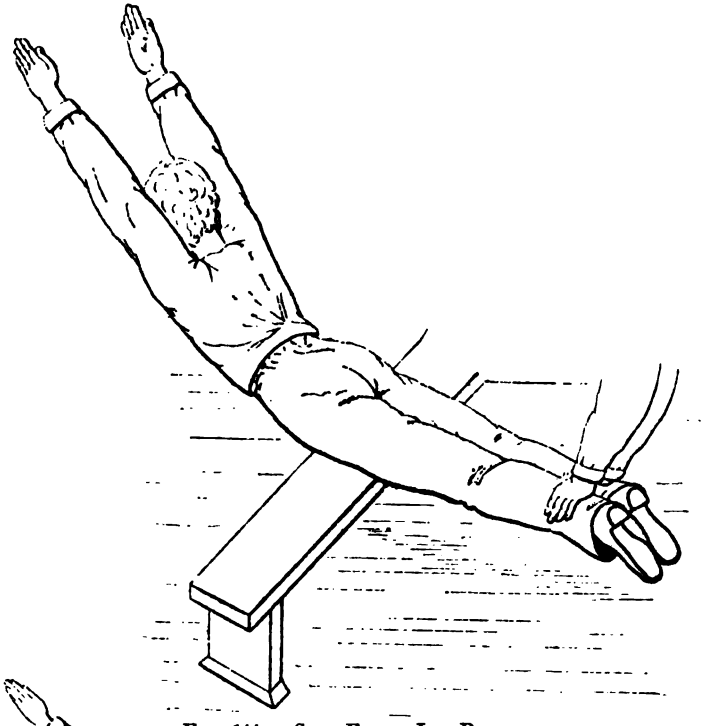


FIG. 144. — STR. FORW. LY. POS.

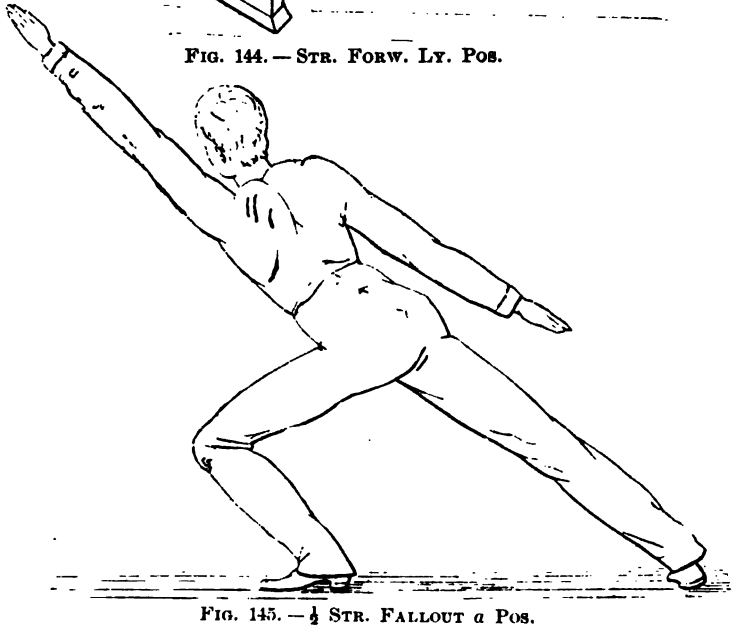


FIG. 145. — ½ STR. FALLOUT *a* POS.

bend!"[1] when he rises as high as he can. The farther forward the pupil is lying, the stronger is the effect of the movement. The most common fault is pushing the head forward.

From fallout pos., besides movements already mentioned, there also are the following: —

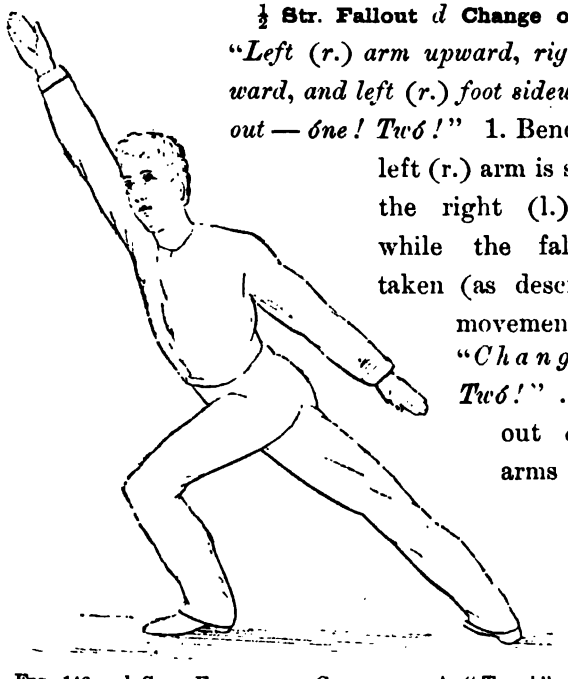


FIG. 146. — ½ STR. FALLOUT *a*, CHANGE OF A. "TWO!"

½ Str. Fallout *d* Change of A. — Command "*Left (r.) arm upward, right (l.) arm backward, and left (r.) foot sideways forward fallout — óne! Twó!*" 1. Bend st. pos. 2. The left (r.) arm is stretched upward, the right (l.) one backward, while the fallout *a* pos. is taken (as described under leg-movements) (Fig. 145). "*Change arms — óne! Twó!*" . . . 1. Bend fallout *a* pos. 2. The arms are stretched in opposite directions, while the trunk is rotated to the side of the arm that extends backward (Fig. 146). "*Change arms and feet — óne! Twó!*" 1. Bend st. pos. (Fig. 80.) 2. ½ str. fallout *a* pos. to the opposite side. Change of arms is now done without change of feet, etc. This exercise is a lateral trunk-movement as well.

Turn Fallout *a* 2 A. Ext. Upw. (Fig. 147). — Command, "*Hips — firm! Left (r.) foot sideways forward — fallóut! Trunk to the left (r.) — turn!* (See lateral trunk-movements.) *Arm-extension upward — óne! Twó!*" . . .

[1] Or "Trunk upward — stretch!"

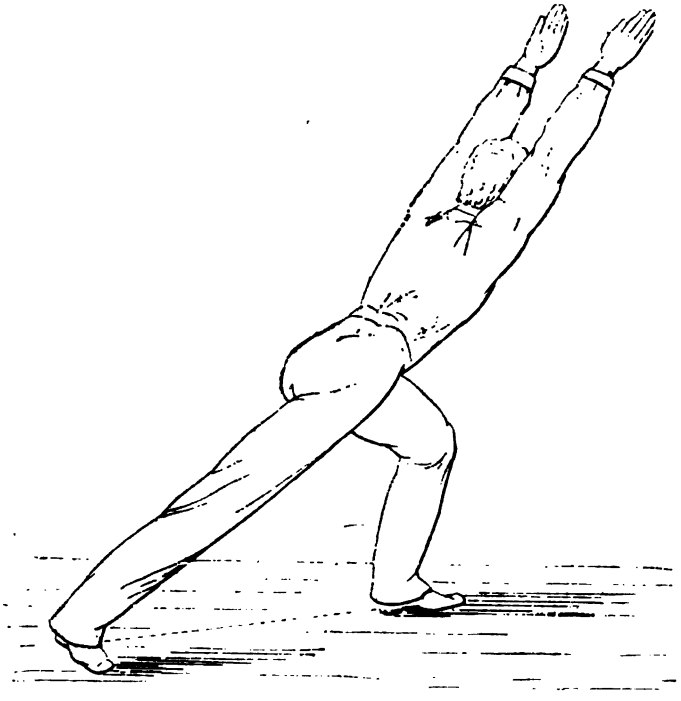


FIG. 147. — STR. TURN FALLOUT *a* POS.

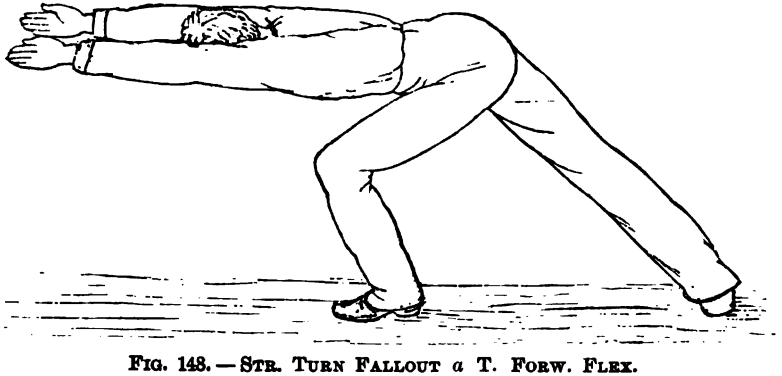


FIG. 148. — STR. TURN FALLOUT *a* T. FORW. FLEX.

Str. Turn Fallout *a* **T. Forw. Flex.** (Fig. 148). — Command, "*Arms upward stretch and left* (*r.*) *foot sideways forward fall-out — óne! Two! Trunk to the left* (*r.*) *— turn! (In this position) Trunk forward — bend! Upward — stretch!*" . . .

The forw. flex. may be executed from the following positions: —

Fallout *a*, *b*, *c*, *d*.

Turn Fallout *a*.

F. Gr. Fallout (Fig. 151).

FIG. 149. — STR. FALLOUT *d* POS.

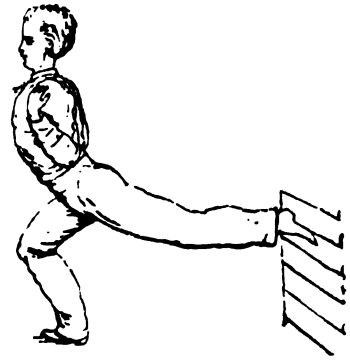


FIG. 150. — BEND FOOT GR. FALLOUT POS.

Besides these movements we also have

Str. Fallout *c* **2 A. Ext. w. Change of Feet Backward.** — Command, "*Arms upward stretch, feet close and left* (*r.*) *foot backward — fallóut!*" (The feet are brought together, when the arms bend.) "*Arm-extension upward with change of feet — óne! Twó!*" . . . This is a slow leg-movement as well.

Foot Gr. Fallout Kn. Flex. — After the pupils are arranged at the stall-bars, command, "*Hips — firm! Left* (*r.*) *foot on the third bar — place! Forward — fallóut!* (see Fig. 26). *Knee* —

bend!" The bent knee bends still more, while the other (backward) one remains straight. "*Stretch!*" The forward knee is straightened to original flexion (about 90°).

The movement preferably is done from str. and rest pos.

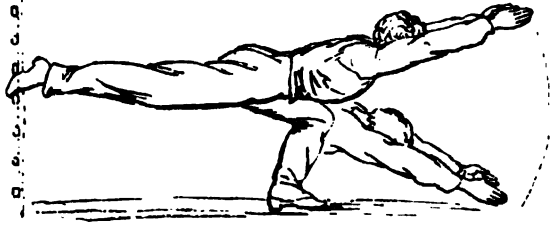


FIG. 151. — STR. FOOT GR. FALLOUT T. FORW. FLEX.

Str. Hor. ½ St. Kn. Flex. (Fig. 152). — Command, "*With arm-extension upward, horizontal half-standing position on the left (r.) foot — One! Two!*" 1. Bend st. pos. 2. The arms are extended upward, and, at the same time, the left (r.) knee bends, the body inclines forward, and the right (l.) leg is lifted backward, so that the arms,

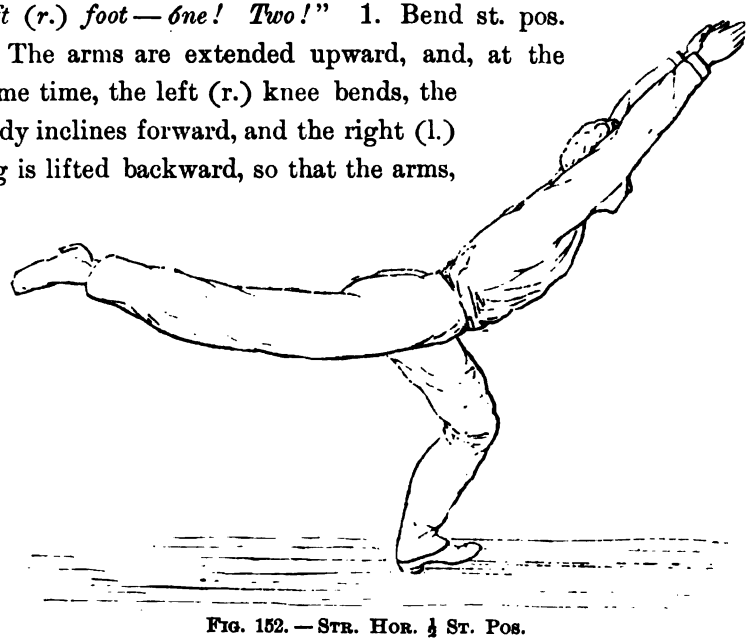


FIG. 152. — STR. HOR. ½ ST. POS.

trunk, and backward leg form an even, nearly horizontal curve. "*Knee — bend!*" The knee of the supporting leg

bends to utmost flexion, the rest of the body maintaining the same position. "*Stretch!*" The knee resumes original flexion. At first this movement (which is prepared by the corresponding leg-movements; see Fig. 49, p. 77, etc.) is practised in ½ str. pos., the other hand taking "hip — firm," either so that the left arm is extended when the left leg is raised, or so that the elevated arm and leg belong to opposite sides. The knee-flexion should not be tried until the commencing position can be correctly taken. Very advanced pupils may try an arm-extension (2 A. ext. upw.) in this position: **Hor. half st. 2 A. ext. upw.** This movement and the one just described are exceedingly difficult on account of their close relationship to the balance-movements — in which class they might also be counted.

The most common fault in these exercises in fallout positions, or their allies, is to let the arms sink forward when they should be in str. pos. The effort of overcoming this natural tendency to faulty posture is what makes these exercises shoulder-blade movements of localization.

Some highly advanced movements are: —

Alt. A. Flg. Upw. and Fallout *b* Forw. (Backw.). — Command, "*Left (r.) arm upward fling and right foot forward (backward) — fallóut! Change arms and feet — one! Twó!*" . . . 1 = Fund. pos. Similar movements are: —

Alt. A. flg. upw. / 2 A. flg. upw. } fallout *b*, *d*, *c*. { forw. / backw.

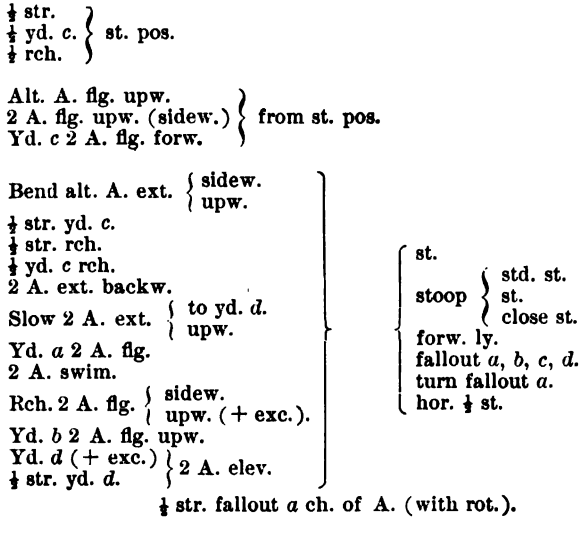
Alt. A. Flg. Upw., Fallout *d* Forw. and Change Forw. — Command, "*Left (r.) arm upward fling, and right (l.) foot long step forward — pláce! Change forward — óne! Twó!*" . . . 1 = Fund. pos. by moving the backward foot forward. 2 = ½ str. backw. rch. fallout *d* forw. with the other arm and leg. The change may occur in one count to the command, "*Change for-*

ward in one count — óne! Twó!" . . . when the pupil merely passes through the fund. pos. forward without stopping, so that the backward foot has a continuous motion forward into fallout pos. This is an exceedingly handsome movement when well performed. Instead of alt. A. flg., 2 A. flg. may be used. This hardly needs description.

Alt. A. Flg. Upw. and L. Elev. Backw. to Hor. ½ St. — Command, "*Arm flinging upward and leg swinging backward to horizontal, left (r.) arm and left leg — fling! Change — one! Twó!*" . . . The limbs of the opposite sides may be used first; later those of the same side. Still later both arms are used instead of one.

The swimming-movements of the arms can, with slight variations, serve as shoulder-blade-movements (see Part III., Preparatory Swimming Exercises).

Synopsis of shoulder-blade-movements, arranged by commencing positions (for progressive list, see Appendix): —


½ str.
½ yd. c.
½ rch.
st. pos.
Alt. A. flg. upw.
2 A. flg. upw. (sidew.)
Yd. c 2 A. flg. forw.
from st. pos.
Bend alt. A. ext. sidew. upw.
½ str. yd. c.
½ str. rch.
½ yd. c rch.
2 A. ext. backw.
Slow 2 A. ext. to yd. d. upw.
Yd. a 2 A. flg.
2 A. swim.
Rch. 2 A. flg. sidew. upw. (+ exc.).
Yd. b 2 A. flg. upw.
Yd. d (+ exc.)
½ str. yd. d.
2 A. elev.
st.
stoop std. st. st. close st.
forw. ly.
fallout a, b, c, d.
turn fallout a.
hor. ½ st.
½ str. fallout a ch. of A. (with rot.).

wg.
Yd. *c.*
¼ str. wg. } forw. ly T. backw. flex.
Rest.
Str.

Yd. *c.* / Str. / Rest. } { st. / fallout *a*, *b*, *c*, *d*. / turn fallout *a*. } T. forw. flex.

Str. / Rest. { F. gr. fallout. / Hor. ¼ st. } Kn. flex.
Str. fallout *b*, c 2 A. ext. and ch. F. backw.

Alt. A. flg. upw. / 2 A. flg. upw. } { L. elev. backw. { forw. / fallout *b*, *d*, *c*. { backw. / L. elev. backw. to hor. ¼ st. / fallout *d* forw. and change forw. { two counts. / one count.

ABDOMINAL EXERCISES.

Synopsis:

ABDOMINAL EXERCISES.

Aim: { Improve digestion. / Support viscera.

Contents: { Contractions of vertical group of abdominal muscles.

Types: { Stoopfall. / Kn. st. T backw. flex.

Effects:
- Physical { Abdomen flattens. / Acceleration of flow in mesenteric veins. / Viscera driven up. / Lumbar spine straightens.
- Physiological { Intestinal absorption increases. / Peristalsis is induced. / Intestinal elimination increases.
- Psychological { (Improved digestion makes a more cheerful disposition.)

Progression:
1. Lying.
2. Stoopfall.
3. Kn. st.
4. F. gr. sitt.
5. ½ Kn. st.
6. F. gr. ½ st.

Limitations:
- Quantity: { Begin late; / Easy for children; / Strong for adults;
- Quality: { Exercises of contraction from below upward before others.

Relations:
1. Resemble arch-flexions.
2. Prepare for certain heaving-movements and vaulting exercises.
3. Introduced by certain balance-movements.

Abdominal exercises are movements bringing into play the muscles of the abdomen for the purpose of improving digestion and cultivating the natural support of viscera.

When the abdominal muscles contract, the arch of the abdomen flattens, and the contents of the cavity become compressed; the blood is driven with greater force from the mesenteric veins; i.e., the *vis-à-tergo* of the portal circulation increases. The same is true of the lymph current from the lacteals. Nutritive material absorbed into the capillaries of the villi and into the lacteals is washed more quickly into the efferent vessels, so that a high degree of osmotic affinity is maintained mechanically, provided the muscles are made to relax intermittently in order to allow the emptied vessels to refill. At the same time the pressure from the external muscles causes a livelier secretion of the digestive juices, producing a more perfect transformation of food-colloids into crystalloids, this also favoring the diffusibility. The pressure of the external muscles also acts as a mechanical irritant, producing peristalsis, and so hastens the passage of chyme and chyle, and drives the fæces into the rectum. The result, then, of these exercises will be a more rapid digestion and a more perfect elimination (expulsion of waste matter) from the intestines.

If the ribs are fixed (by contraction of posterior muscles, or by tension in commencing position), so that the chest will not descend when the muscles contract, viscera become driven up; if the ribs descend, the opposite thing will occur. For that reason it is well not to apply abdominal exercises until a reliable, good posture of the chest has been secured by other movements (heaving-movements, balance-movements, and shoulder-blade-movements), and consequently this class of exercises usually should not appear in the table until after five or six weeks'

practice. Even such movements where the commencing position fixes the chest, cannot be applied in the early lessons for beginners; for in young individuals it will happen that the sternum becomes depressed, the costal cartilages yielding to the tension of the rectus abdominis, and a deformity may be produced which is very hard to overcome. So it is well to exercise precaution, lest bad effects be obtained instead of good ones. It is a lucky coincidence, however, that children do not need abdominal exercises as much as adults do, since, as a rule, their digestive apparatus has had less opportunity to become inert; and, consequently, it is safe to leave these movements out in gymnastics for little folks, or at least to make them easy. But adults should have the full benefit of them; and for them it may even be useful in some instances to give more than one such exercise in each lesson; all the more since activity of the abdominal walls will prevent and overcome the deposition of adipose tissue in this region.

The rectus abdominis being divided into transverse sections by tendinous slips, it contracts from slip to slip instead of, like other voluntary muscles, from attachments to centre, the wave travelling from sternum to pubes or the reverse, according to which end is the most fixed at the time, and to whether the trunk is flexed on the thigh or the thigh on the trunk. When the contraction travels from above, viscera become depressed, unless the chest is well fixed. For that reason lying (2) L. elev. and stoopfall pos. should precede movements from other commencing positions, in order to make sure that the compression of the abdominal cavity may occur from below upward, and that no undesirable effects may be produced. The progressive relation of other commencing positions depends on the law that a muscle contracts more easily when its ends are

drawn apart, less so when they are brought nearer together. Within each position the progression follows the laws of leverage, continuity of movement, etc.

By repeated exercise the muscles shorten permanently, so that in this case viscera will have a firmer support, and the pelvis will rotate forward through the lifting of the pubic arch. Secondarily this will cause a straightening of the lumbar curve, even so that abdominal exercises form an excellent cure for *lordosis* ("sway-back").

Kn. st., F. gr. sitt., etc., backw. flex. resemble arch-flexions, but are executed without arching of the spine, the trunk merely inclining backward from the lowest joint supported by the floor or apparatus. In the arch-flexions the movement travels from the chest into the abdomen, so that the latter is brought into play only after the chest has reached extreme extension. In the abdominal exercises the movement travels from the pelvis into the chest, the latter not becoming directly involved (except to fix the upper abdominal insertions) until the hip is stretched. In that manner — considering the hip-joint — the final position of an abdominal exercise is like the commencing position of an arch-flexion. For instance, Wg. F. gr. sitt. backw. flex. is an abdominal exercise only so far as to bring the trunk and legs in a straight line; for the limit of abdominal effect has then been reached, and flexion beyond that position must occur by arching of the spine, and will bring about the effects of arch-flexion.[1] The position illustrated in Fig. 76 may be taken from "hand-stand" by letting the legs sway over until the feet touch the floor; there is then a gradual lengthening (excentric activity) of the abdomen and later of the chest; while, when the position is taken by bending backward from str. std. st. pos., the chest is first brought into play.

[1] Inclining backward from standing position is neither one nor the other, as it usually causes backache and holding of the breath.

The first movement is an abdominal exercise; the last is an arch-flexion.

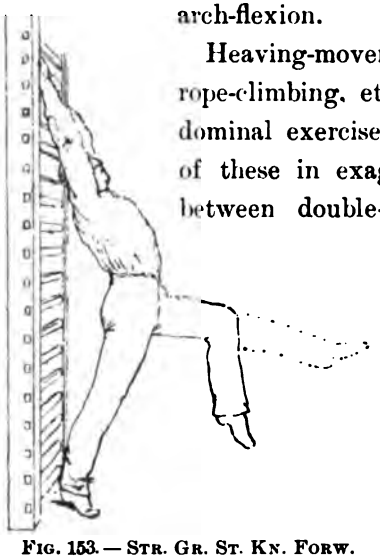


FIG. 153. — STR. GR. ST. KN. FORW. FLEX. AND EXT.

Heaving-movements like Cr. hang., oblique rope-climbing, etc., should be prepared by abdominal exercises, since they have the effects of these in exaggeration. Likewise vaulting between double-bars (face up, one hand on each bar, or face forward, both hands on the upper bar), "sit-over" bar, horse or box, vaulting over bar with rope, etc., should be prepared by corresponding abdominal exercises. On the other hand, movements of the cr. ½ st. type (see balance-movements) are to be considered as introductory to abdominal exercises of similar types.

Str. Gr. St. Kn. Forw. Flex. and Ext. (Fig. 153). — The pupil stands close up to the stall-bars, turning his back to them. At the command, "*Arms upward — strétch! Grásp!*" he stretches his arms up, grasps a bar as high as he can reach, and lets his body arch forward so that arms and legs are straight. Command, "*Left (r.) knee upward — bend! Knee forward — stretch! Bend! Stretch! . . . Change feet — óne! Two!*" . . . just as for the corresponding free-standing exercise (see leg-movements), which it resembles in execution. A doorway, the

FIG. 154. — STR. LYING 2 L. ELEV.

vertical poles, etc., are just as useful as apparatus for this movement.

Str. Lying 2 L. Elev. (Fig. 154). — The pupil lies down flat on the floor (face up), and after the teacher has ordered stretch position, he commands, "*Legs — lift! Sink!*" . . . With straight knees and extended insteps, the pupil raises his legs slowly and lowers them as slowly. At first the elevation is very slight — just enough to be called an elevation — a few days later it is done to 90° (or over), and still later it is done to 45°, where a distinct pause is made before the legs are again lowered. In this way, this movement has a progression in itself. The amount of elevation is indicated by adding, "*slightest elevation*," "*all the way up*," or "*half-way*," to the preparatory part of the command. The tendency to tip the arms up can be overcome if the hands grasp the horizontal bar put low (or other apparatus, Fig. 155), or by having the hands held down by another pupil. If the floor is unsuitable and benches are at hand, the pupils lie down on these instead, lengthwise, one pupil at each end, their hands grasping the edges of the bench (Fig. 156).

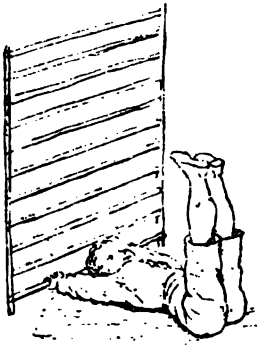


Fig. 155.

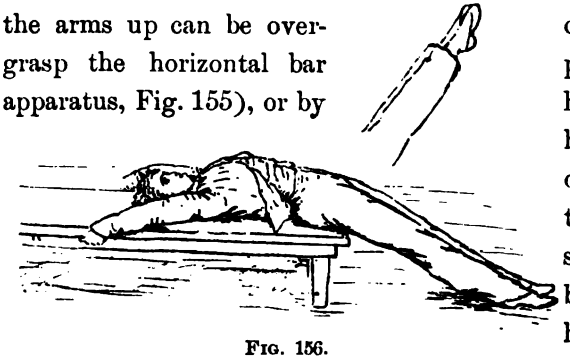


Fig. 156.

For beginners the movement may take the following form:

"*Knees upward — bend!*" The knees are drawn up into 2 cr. *a* pos. "*Knees — stretch!*" The legs are stretched into 2 cr. *b* pos. "*Legs — sink!*" The legs are lowered as described above. "*The same — one! Two! Three!*" etc. This is called EXCENTRIC 2 L. ELEV. Still earlier (for weak women especially), ALT. L. ELEV. may be used. Command, "*Left* (*r.*) *leg — lift! Sink!*" etc.

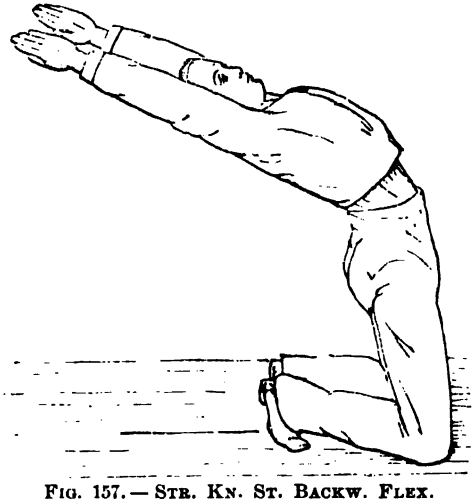


FIG. 157. — STR. KN. ST. BACKW. FLEX.

Str. ly. 2 L. abd.[1] — Command, "*To* 45° *legs — lift! Leg abduction — one! Two! . . . Legs — sink!*" 1 = The straight legs are spread apart. 2 = The legs are brought together.

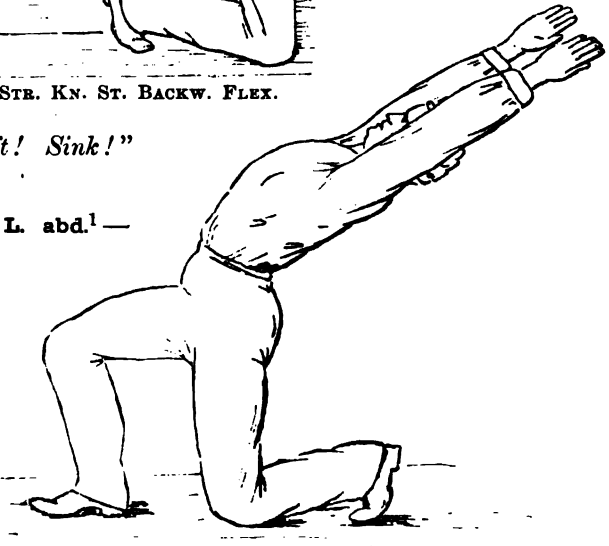


FIG. 158. — STR. HALF KN. ST. BACKW. FLEX.

Kn. St. Pos. (Fig. 157). — To take the knee-standing posi-

[1] For introduction to L. swim. See Appendix.

tion, first get into courtesy sitting position (leg-movements, Fig. 39), and at the command, "*Kneel!*" move the knees forward until they rest on the floor; the balls of the feet should still rest on the floor, so that standing position can be resumed by merely moving the centre of gravity backward, and then extending the legs. The trunk should be erect.

½ Kn. St. Pos. (Fig. 158).— To take this position, one leg is moved backward as in fallout *d* pos., and the knee is bent until it rests on the floor. Meanwhile the other knee is bent so that the leg is vertical, the thigh horizontal, and the foot rests fully on the floor; the ball of the backward foot is also resting there,[1] and the trunk is erect. The command is, "*On the left (r.) — knéel! Change — óne! Twó!*" These two are commencing positions for various abdominal exercises enumerated below. The movements are: —

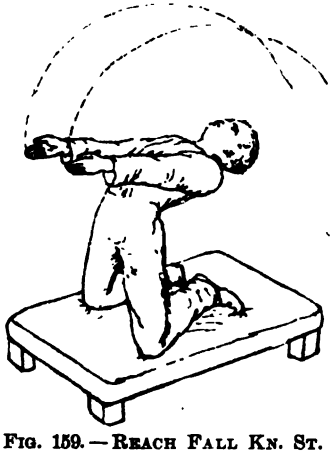


FIG. 159. — REACH FALL KN. ST. 2 A. FLING.

Wing-Bend-yd. *c* / ½ Str. wg. Rest-Str.- { Kn. st / ½ Kn. st. } T. backw. flex. (Figs. 157 and 158).[2]

Bend fall { Kn. st. / ½ Kn. st. } 2 A. ext. { sidew. / upw. / alt. A. ext. upw.

yd. *a* Reach fall { Kn. st. / ½ Kn. st. } 2 A. fling. (Fig. 159).

[1] Some instructors claim that the backward foot should be resting with the toes on the floor, the instep being stretched. This form may be more æsthetic, but affords less balance and less ability to resume standing position.

[2] The illustrations of these movements show the trunk too much arched.

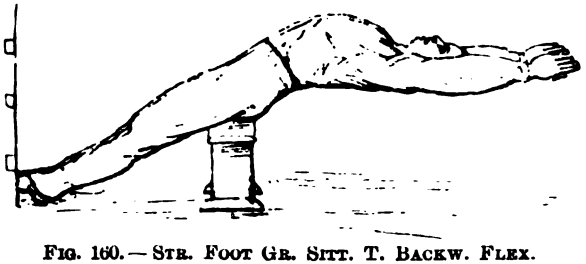


FIG. 160. — STR. FOOT GR. SITT. T. BACKW. FLEX.

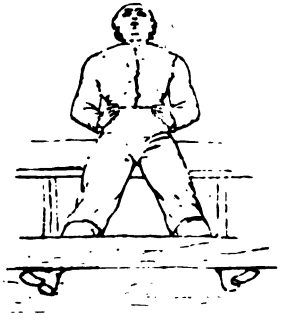


FIG. 161. — WG. FOOT GR. SITT. T. BACKW. FLEX.

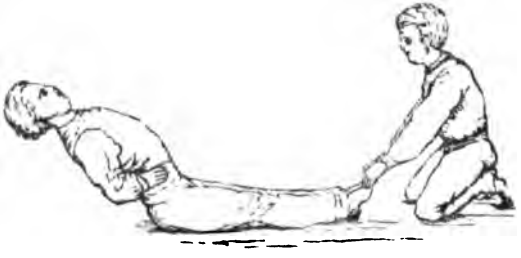


FIG. 162. — WG. FOOT GR. SITT. T. BACKW. FLEX.

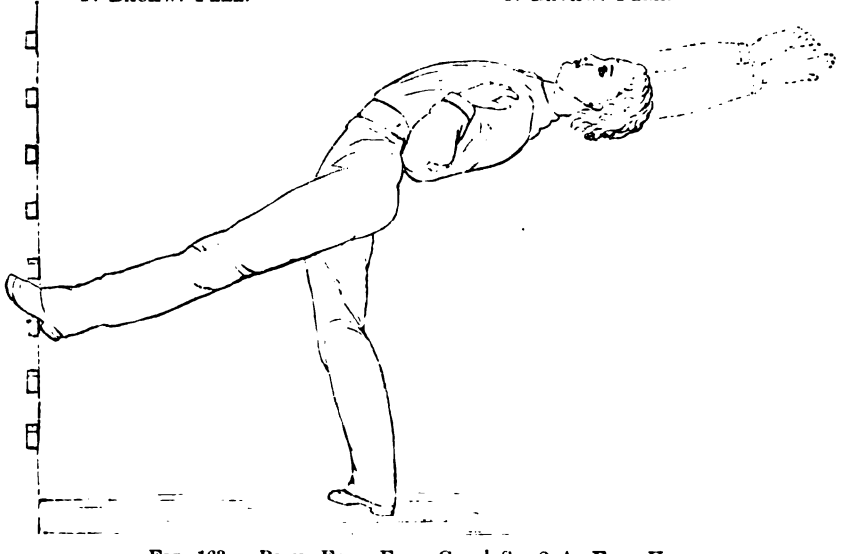


FIG. 163. — BEND FALL FOOT GR. ½ ST. 2 A. EXT. UPW.

In all these movements the trunk should incline backward without arching (command, "*Trunk backward — bend! Upward — stretch!*" or, "*Trunk backward — incline! Raise!*") In ½ str. wg. ½ Kn. st. backw. flex. the right arm is extended upward when the left knee is on the floor, and *vice versa*. Other movements will hardly need description.

Foot. Gr. Sitt. Pos. (Fig. 160, etc.). — The pupils sit on the benches facing the stall-bars, and place their feet between the second and third bars; the trunk is erect and the chest expanded. The benches are at such a distance that the pupils have straight knees. If tall pupils happen to sit beside short ones, the bench should accommodate the short ones, and the tall ones adjust the distance by spreading their feet apart. In absence of stall-bars, the horizontal bar gives a good grasp for the feet (Fig. 161). In total absence of apparatus, the pupil may sit on the floor, another pupil holding his feet (Fig. 162). In a schoolroom, the pupil may sit on the desk and place his feet under the seat (or back rest) of his chair (which he faces). Movements in this position are: —

Wg.-
Bend-
Yd. *c*
½ str. wg.
Rest-
Str.- } F. gr. Sitt. T. Backw. Flex.

The flexion has a progression in itself; viz., 1. Slightest flexion; 2. Flexion till the floor is touched; 3. Flexion to horizontal position. (Compare str. lying 2 L. elev.)

Bend fall F. gr. sitt. { 2 A. ext. sidew.
alt. A. ext. upw.
2 A. ext. upw.

and

yd. *a*
Reach } fall F. gr. sitt. 2 A. flg.

will need no description.

Foot Gr. ½ St. Pos. (Fig. 163). — The pupil stands facing the

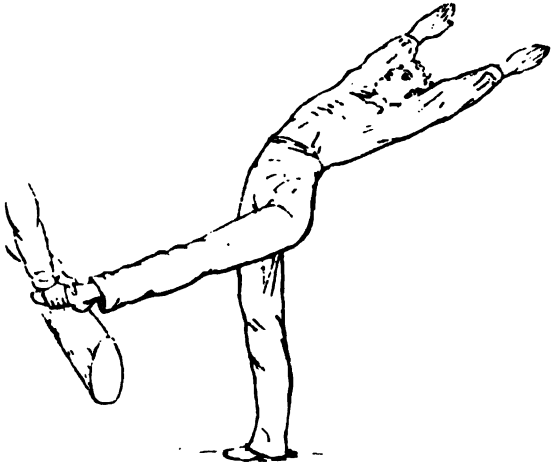


FIG. 164.

stall-bars and one step away from them; he places one foot forward between the third and fourth bars, and keeps both

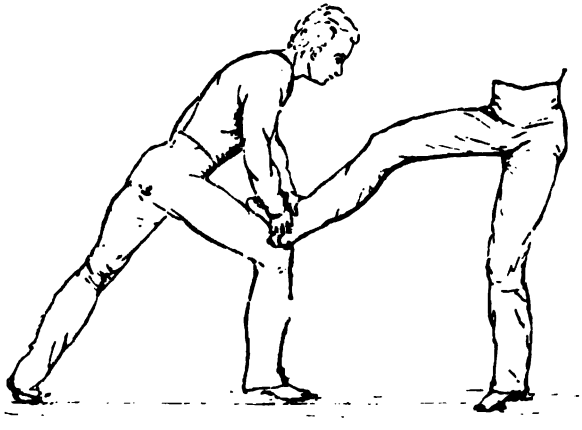


FIG. 165.

knees straight; the trunk is erect. In absence of stall-bars, the lifted foot may be placed on a bench (on a chair; on the

knee of another pupil [Figs. 164 and 165]), and held there by another pupil. Movements in this position are: —

Wg.-Bend-yd. c ½ str. wg. Rest-Str.- } Foot Gr. ½ St. T. Backw. Flex.;

Bend Fall Foot Gr ½ St. { alt. A. ext. upw. / 2 A. Ext. { Sidew. / Upw.

yd. *a* Reach } Fall Foot Gr. ½ St. 2 A. Fling.

In all these movements, both knees are kept straight, and the body is bent so far back that it is in a line with the raised leg. If this leg is raised to horizontal position (or above the fourth bar), the knee of the supporting (backward) leg must bend as the trunk is bent backward (Fig. 166). This form, however, is used only for very advanced classes.

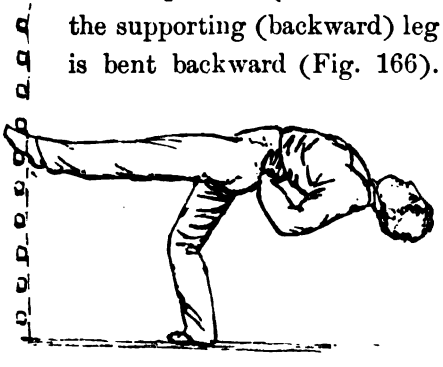


Fig. 166.

In ½ str. wg. F. gr. ½ st. backw. flex. the right arm should be in ½ str. pos. when the right foot is elevated, and *vice versa*.

In all these backward flexions it is very important not to check the respiration. The chest must be kept well expanded, and the head held well back. "Bréathe!" "Let your head go!" "Fall backward!" are excellent exhortations.

Stp. Falling Pos. (Fig. 168). — Command, "*Stoop falling óne! Twó!*" 1. The pupil takes courtesy sitting position, and places his hands on the floor in front of him, the hands

about a foot apart, and pointing obliquely inward (Fig. 167). 2. Keeping his body straight, and his hands in the same place, the pupil throws his feet backward so that his legs and body are in a straight line from head to heels. The under side of the toes should rest on the floor (not the upper side, as described by some authors. Compare Kn. st. pos.). To return to standing position, command, "*Position — óne! Twó!*" 1. The feet are placed forward, behind (or between) the hands as above. 2. Fundamental position is resumed.

To take the stoop falling pos., is in itself an abdominal exercise, as it could not be maintained were it not for the strong

FIG. 167.

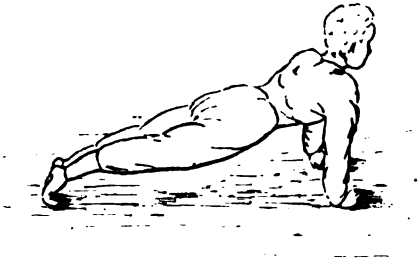


FIG. 168. — STOOP FALLING POSITION.

contraction of the abdominal walls. If it is desirable to make the pupils stay for some time in this position, keep them busy by commanding a rapid head-rotation:

Stp. Fall. H. Rot. (For commands, etc., see Introductions.)

To teach the pupils to quickly take the stp. fall. pos., the moving of the feet backward and forward may be practised as a separate movement. This also furnishes a short rest for the abdominal muscles when the movement (position) is to be made stronger by longer duration:

Stp. Fall. F. Placing Forw. and Backw. — Command, "*Stoop falling — óne! Twó! Feet forward — pláce! Backward — pláce! The same — óne! Twó!*" . . .

In this position the following movements may be done:

Stp. Fall. 2 A. Flex. — After commencing position is taken, command, "*Arms — bend!*" The body remains straight, and the arms bend until the nose touches the floor. "*Stretch!*" The arms are straightened.

Stp. Fall. L. Elev. — After commencing position, command, "*Leg-elevation — óne! . . . Fóur!*" 1. The left (r.) leg is raised with straight knee. 2. The left (r.) leg is lowered, and the foot again put on the floor. 3, 4. The right (l.) leg is raised and lowered. This exercise can also be done while the arms are bent, and is then called

Bend Stp. Fall. L. Elev.

Stp. Fall. A. Elev. — For command and description, see stoop fall. L. elev., and exchange the words "leg" for "arm," "knee" for "elbow," and "foot" for "hand."

FIG. 169. — HORIZONTAL STOOP FALL. POS.

Stp. Fall. A. and L. Elev. is done so that the left (r.) leg and the right (l.) arm are simultaneously raised and lowered, etc. Command, "*Arm and Leg elevation — óne! . . . Fóur!*"

Horizontal Stp. Fall. Pos. (Fig. 169) resembles the stoop falling position, except that the feet are placed on a bench or other apparatus, so that they are on a level with the shoulders. If the feet are placed still higher (on stall-bars, horizontal bar, etc.), the position is called

Inclined Stp. Fall. Pos. (Fig. 170).

In either position, double arm-flexion can be done, and for moderate elevation, also H. rot., L. elev., A. elev., A. and L. elev.

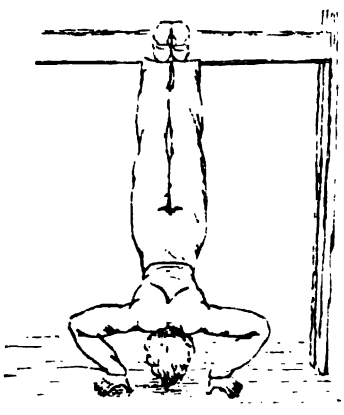


FIG. 170.— INCL. STP. FALL. 2 A. FLEX.

The incl. stp. fall. pos. can be taken from stp. fall. by having another pupil grasp the feet of the one doing the movement and lifting them from the floor (Fig. 171).[1] This form, however, is suitable only for advanced pupils and grown persons.

If the legs are raised beyond vertical position and resting forward against a wall (stall-bars, or other apparatus), the position is called

Reverse Stp. Fall. Pos. (Fig. 173). — The pupil stands facing the stall-bars (or wall) and two steps away from them, one foot behind the other (walk *b* st. pos.) (Fig. 172). At the command, "*Reverse stoop falling position — place!*" he places both hands on the floor (as in stoop fall. pos.) and swings his legs up until his feet rest against the wall, the weight of the body being carried by the straight

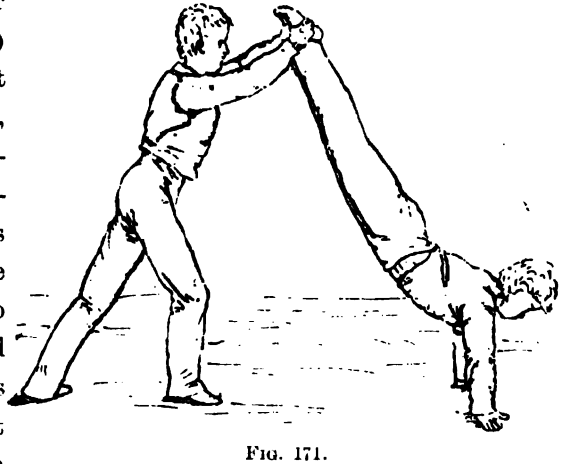


FIG. 171.

[1] Fig. 171 is faulty, inasmuch as the pupil whose hands are on the floor shows these turned out instead of obliquely inward.

arms. When the head is carried well up and the back is arched, there is no danger of a fall. In this position, arm-flexion can be done to the command, "*Arms — bend! Stretch!*" For more safety, the feet may be inserted between the bars.

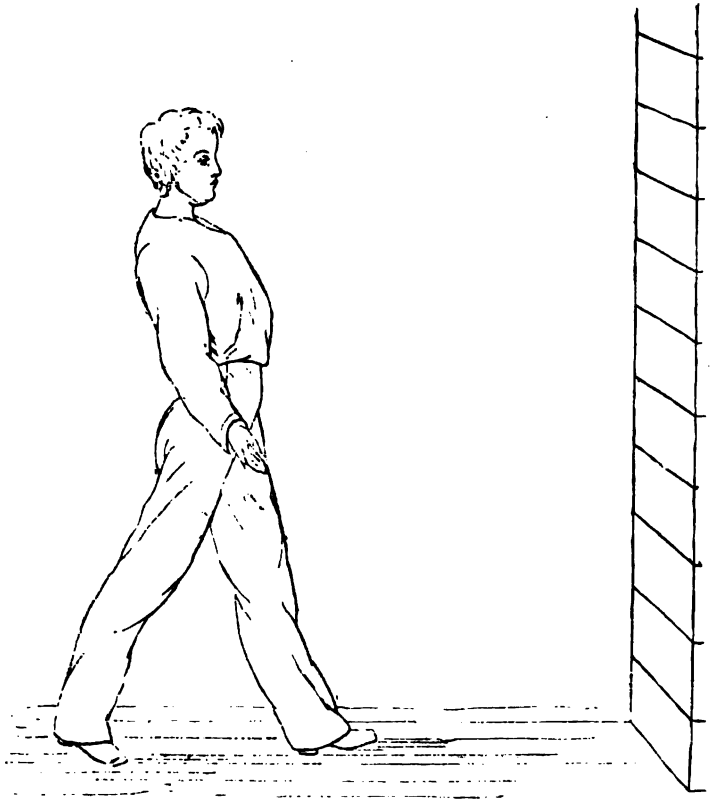


FIG. 172. — POSITION PREPARATORY TO REV. STP. FALL.

This position, naturally, is to be tried only by far-advanced pupils; those who have a flexible back may move the feet down from bar to bar until the feet stand on the floor in front of the head (as in gr. arch st. pos. w. hands on the

floor, Fig. 76), which position might be named **rev. stp. fall. w. feet on the floor.** The rev. stp. fall. pos. may also be done with living support, one pupil standing in front of the other

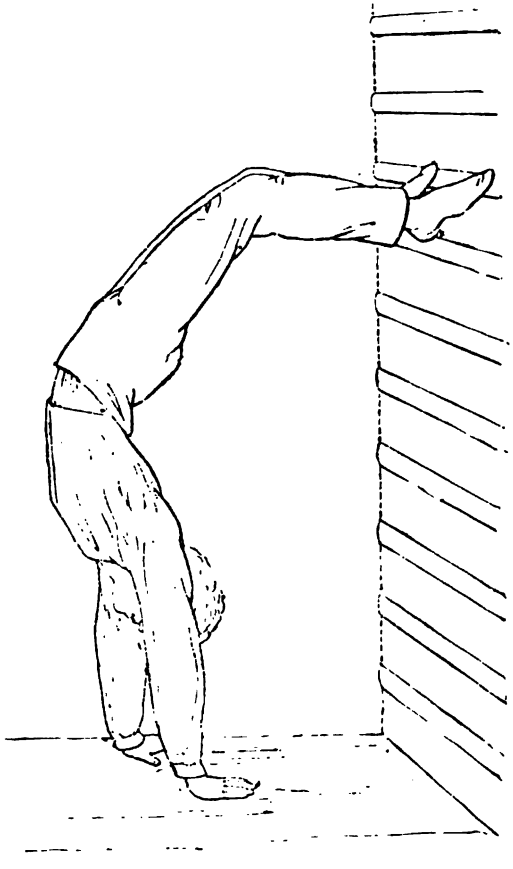


FIG. 173. — REV. STP. FALL. POS.

and grasping the feet when they swing up (Fig. 174), or, still better, the legs near the ankles. Without support the position is called *Hand stand.*

The heaving-movements in cr. hang. pos. must be considered as strong abdominal exercises as well; and whenever a heaving-movement of this kind is used, there need be no other abdominal exercise in the same lesson.

For children, leg-elevation in fall. hang. pos. is suitable as an abdominal exercise; the arms may be straight or bent (Fig. 175). After fall hang. pos. is taken, command,

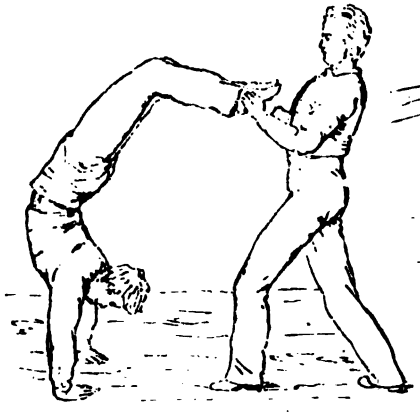


FIG. 174. — REV. STP. FALL. POS. WITH LIVING SUPPORT.

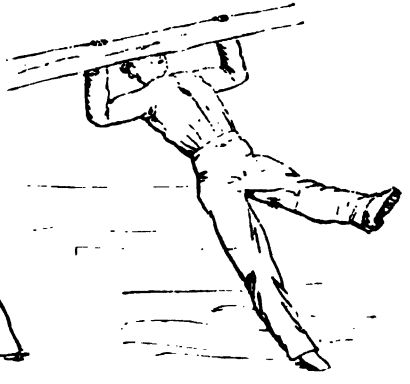


FIG. 175. — BEND. FALL. HANG. L. ELEV.

"*Leg-elevation, left* (*r.*) — *óne! . . . Fóur!*" The legs are raised and lowered on the same principles as in stoop fall. L. elev.

In the schoolroom the stoop fall. pos. may be done by having the pupil stand in the aisle facing the back of the room; placing a hand on the chair on either side of him, he swings his feet backward at the teacher's command. (For cr. hang pos. in schoolrooms, see heaving-movements.)

The introductory swimming-movements of the legs described in the appendix are also to be considered as abdominal

exercises, and are used as such in the general gymnastic progression.

Synopsis of abdominal exercises arranged by commencing positions: [1]

Str. gr.
Str.
Rest.
Wg.
- alt. L. elev.
- 2 L. elev. (exc. / conc.)
- 2 L. swim.
- 2 L. abd.

Stoop fall.
Hor. stp. fall.
Incl. stp. fall.
- H. rot.
- (Foot placing forw. and backw.)
- L. elev.
- 2 A. flex.
- 2 A. flex. and L. elev.
- A. elev.
- A. and L. elev.

Rev. stp. fall. 2. A. flex.

wg.
Bend
yd. *c*
½ str. wg.
rest.
str.
- Kn. st.
- Foot gr. sitt.
- ½ Kn. st.
- Foot gr. ½ st.

T. backw. flex.

Fall
- 2 A. ext. sidew.
- alt. A. ext. upw.
- 2 A. ext. upw.
- 2 A. fling. sidew. (from yd. *a*)
- 2 A. fling. upw. (from reach)

[1] For progressive list, see Appendix.

LATERAL TRUNK-MOVEMENTS.

Synopsis: —

LATERAL TRUNK-MOVEMENTS.

- *Aim:*
  - Affect large vessels.
  - Develop waist-muscles.
- *Contents:*
  - T. rot.
  - T. sidew. flex.
  - Oblique backw. flex.
  - Oblique sidew. flex.
  - L. elev. sidew.
- *Types:*
  - Trot.
  - T. sidew. flex.
- *Effects:*
  - Physical.
    - Accelerate flow in vena cava.
    - Widen chest.
    - Produce internal elevation.
    - Develop nature's corsets.
    - Improve portal circulation.
  - Physiological.
    - Increase activity of liver.
    - Increase capillary osmosis from intestines.
    - Increase elimination from alimentary tract.
- *Progression:*

Rot.	Sidew. flex.
Turn st. 2 A. ext.	Turn st. sidew. flex.
Turn st. backw. flex.	L. elev. sidew.
Turn arch st. 2 A. ext.	Sidew. hang.

- *Limitation:* Rotation precedes sidew. flex. in same lesson.
- *Relations:*
  1. Substitutes for heaving-movements.
  2. Complete effects of abdominal exer.
  3. Merge into
     - Heaving-movements.
     - Vaulting.
     - Games and sports.

Lateral trunk-movements[1] consist in rotations and sideways flexions of the trunk and exercises derived from these types. The oblique muscles of abdomen and back being brought into play, it is evident that they will develop from this kind of movements. Rotations especially bring into play the transversalis

[1] By some writers erroneously called "alternate side movements." Foot placing sidew., alternate A. ext. sidew., etc., may be "alternate side movements," but they are not lateral trunk-movements.

abdominis, — "nature's corsets," — and this growing stronger, viscera will become better supported. But let us examine a little more into the details of the typical forms, and we shall find that the effects are much more far-reaching.

Anything that is rotated grows shorter if its two ends are movable in a longitudinal direction; but if the ends are fixed the twisted body will suffer a diminution of diameter. If the trunk is rotated upon its own axis it not only will not shorten, but, the vertebræ acting like screw joints, it will actually lengthen.[1] Simultaneously there will be a diminution of diameter, the measurement around waist and abdomen growing smaller. Also, the muscles of these parts contract to produce the movement; and it follows that a strong pressure is exerted upon viscera. These become driven up toward the expanding chest; for in rotation to either side, there is an oblique expansion of the chest to that side, and, the capacity of the latter increasing, the movement will produce "thoracic aspiration": the viscera are drawn up, and the flow in the vena cava and thoracic duct increases. If the body is bent backward from previous rotation it is evident that the effect of arch-flexion is added to the above, and thus the effect of rotation becomes highly emphasized. For that reason backw. flex. from turn pos. is to be considered as an advanced form of trunk rotation; and it is given a place among lateral trunk-movements rather than among arch-flexions, the long base and gentle tension (excentric contraction) making its effect of arch-flexion rather too mild to be considered as such.

If the trunk is bent to the left, with the spine arched sideways from head to sacrum,[2] the inferior vena cava will become

[1] This can easily be ascertained by measurements taken in sitting position with fixed hip-joints.

[2] For argument as regards execution, see Appendix.

stretched, since it is situated on the right side of the spine in such a manner that it must follow the movements of the latter. According to Prof. Lovén [1] a moderately stretched vein will not diminish in diameter; [2] i.e., its capacity will increase: it then follows that more blood will rush into the vena cava during flexion to the left. When the spine straightens, the vessel resumes original size; and at flexion to the right it becomes compressed; so that an alternate flexion to each side will affect the venous currents as if a force pump had been introduced somewhere into the vessels, especially those which immediately feed the vena cava. The hepatic veins are emptied with greater speed; and, secondarily, there is a suction through the capillaries of the liver. Also, as the trunk bends to the right, the liver becomes compressed and the contents of its vessels driven onward; and as the trunk straightens and bends to the left the vessels refill; so that the alternate sideways flexion directly hastens the flow through the liver and secondarily increases the *vis-à-fronte* in the portal vein and its afferent vessels. The osmosis from the intestines will increase, since the material diffused into the blood will be drawn off with greater speed.

By increasing the circulation through the liver, the sideways flexions will heighten the activity of that organ; bile will be secreted in greater profusion; peristalsis will increase; the bolus will become softer; and the expulsion of fæces will occur with greater ease.

As the trunk is bent to one side the ribs of the opposite side are spread apart; and if the movement is repeated with sufficient frequency, the chest will be found to widen permanently.

[1] We consider Prof. Lovén undisputed authority on this point.

[2] This may be due partly to the pressure of the blood, partly to the mechanical irritation of the vaso-motor nerves — and probably mostly to the latter, as otherwise it would be hard to explain a fact contrary to the laws of physics.

Simultaneously the "soft" tissues below the ribs are drawn in, so that the proportions will somewhat change: the waist will appear smaller, even though its actual measurement has increased. In that manner the large waist of a gymnast may not necessarily give him a "homely, tubular shape."

The abdominal exercises condense the liquids each side of the animal membrane — increase osmotic affinity; the rotations draw off the diffused nutritive material; and the sideways flexions multiply both the *vis-à-fronte* in the portal vein and the *vis-à-tergo* in the mesenterics, drawing off the saturated venous current and driving fresh layers forward. For that reason the best sequence of movements in each lesson is to let the rotation be preceded by abdominal exercises, and followed by sideways flexions. This, however, need not be rigidly adhered to, apparatus, or externalia generally, making variations desirable and necessary.

In rotations a progression is made by gradually isolating the rotators of the thigh from the movement by changing from stride st., to wlk. st., to sitt. or kn. st., etc., pos.;[1] by bending backward from turn pos.; by raising the centre of gravity (wg. to yd., rest. str. pos.), so as to produce greater effort of equilibrium; and by remaining in the turn or turn arch pos. while executing some exercise (2 A. ext., 2 A. flg.) so as to produce statical activity of the rotating muscles.

In sidew. flex. progression is made by diminishing the base; by increasing the lever (or the weight); by making the movement more complex (turn st. sidew. flex.); and by increasing the speed of motion, etc. It should be mentioned that in rapid lateral trunk-movements the increase of return current from the abdomen becomes very high, centrifugal force being added to

[1] For argument, see Appendix.

the *vis-à-fronte:* in rotations the blood is driven into the arms and hands, in sidew. flex. into the chest and head.

Since lateral trunk-movements have a strong effect of chest expansion they can be used as substitutes for heaving-movements; so that in absence of apparatus the lat. T. movements should be multiplied. Rotations would correspond to exercises of vertical expansion (2 A. ext. upw., vert. trav.), sideways flexions to those of lateral expansion (2 A. ext. sidew., hor. trav.).

Physiologically the lateral trunk-movements finish up the work begun by the abdominal exercises of the same lesson, and no lesson is complete without them.

However, heaving-movements, like serpentines through ladders, include rotations and sideways flexions, and, to save time, lateral trunk-movements can be omitted when such exercises appear as second heaving-movements. The same is true of such exercises as vaulting through double-bars, etc.

All forms of games and sports — and, for that matter, complex exercises generally — are largely lateral trunk-movements. For that reason, when gymnastic games, or other general exercises (complex parallel-bar exercises, fencing, etc.) are introduced into the lessons, they are best put in to substitute or to emphasize the lateral trunk-movements.

Once acquired, lateral trunk-movements can be well used as introductions. Especially suitable as such are 2 A. ext. from turn pos. and allied forms.

Trunk Rotation. — In this movement the trunk is rotated around its own axis; the body below the waist remains as immovable as commencing position will permit, and the head, shoulders, and arms follow the movement of the trunk. Common faults in this movement are pushing the shoulder forward, turning the

head so that it loses its position relative to the shoulders,[1] bending the trunk to the side or forward, bending the knee of the side toward which rotation takes place, and turning the feet out of place.[2] The simplest movement of this kind is: —

Wg. Close St. T. Rot. — Command, "*Feet close and hips —firm! Trunk to the left (r.) — turn! Forward — turn!*" . . . The movement is done slowly. When the trunk is rotated to either side the position is called **turn pos.** The movement is made stronger by using yd., rest, or str. (Fig. 176) pos. of the arms. The rotation is performed on the same principles in the st. and stride st. positions. In the walk st. positions (all of which may be used), the rotation takes place to the side of the advanced foot. For instance:—

Fig. 176. Close St. T. Rot.

Wg. Wlk. *b* **St. T. Rot.** (Fig. 177). — Command, "*Left (r.) foot forward and hips —firm! Trunk to the left (r.) turn! Forward — turn! . . . Change feet — one! Two! Trunk to the right (l.) — turn!*" . . .

The rotation may be done also to the side of the backward foot. It is then called **rev. T. rot.**, and its final position is called **rev. turn pos.**

Of fallout positions, only *a* is used (Fig. 178). The rev. turn fallout *a* pos. may be taken so that the rotation and foot movement are done simultaneously. Command, "*Hips —firm! With rotation, left foot sideways forward —fallout! Change feet and sides — one! Two!*" . . . When done in this manner, the head is turned in the direction of the forward foot.

[1] For advanced classes the head may be brought into rotation too, as this is æsthetically more correct, even though in the beginner it is liable to lead to faulty posture.

[2] For further discussion of execution, see Appendix.

In half str. pos. this is a truly æsthetical movement; it is done as follows: —

Fig. 177. — Wg. Wlk. *b* St. T. Rot.

½ Str. Rev. Turn Fallout *a* Pos. (compare Fig. 145). — Command, "*Left arm upward, right arm backward, with rotation, left foot sideways forward fallout — 6ne! Twó!*" 1. Bend st. pos. 2. Hlf. str. rev. turn fallout *a* pos.; the feet are in fallout *a* pos.; the trunk and backward leg are in a straight line; the trunk is rotated so that the shoulders are parallel with a line through the heels; the arms are parallel with the backward leg, — the left has the palm turned up, the right the palm turned down; the head is turned in direction of the advanced foot. "*Change arms, feet, and sides — 6ne! Twó!*" (As above.) An advanced class may do the change of feet zigzag forward (or backward). Command, "*Change arms, sides, and feet forward (backward) — 6ne! Twó!*" . . . 1. The backward foot is placed beside the forward one, and the arms bent. 2. The position is taken to the other side by moving this same foot sideways forward, etc. This form of the movement requires a great deal of muscular control, and should be used with moderation. The movement illustrated in Fig. 146 is a lateral trunk-movement as well as a shoulder-blade movement and may be used as such.

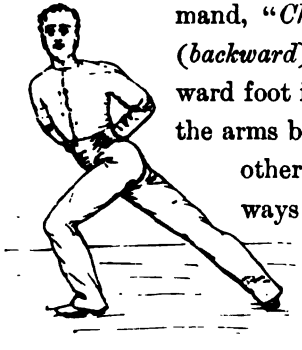


Fig. 178.
Wg. Turn Fallout *a* Pos.

Children often find it difficult to keep their feet still while

rotating the trunk. In such a case, let the pupils sit astride a bench (or chair) (Fig. 179), and command the movement in usual order. For children the rotation may be done also in knee st. pos. Besides, these two positions supply a higher degree of muscular isolation by excluding the hip from the movement.

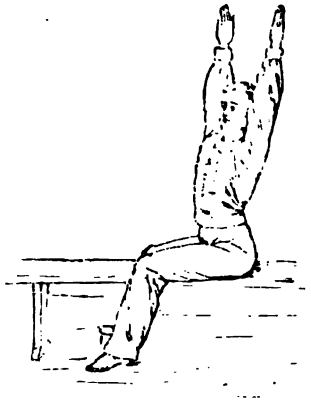


Fig. 179.
Str. Stride Sitt. T. Rot.

By advanced pupils, the rotation may be done with the utmost speed in the yd. std. st. and str. std. st. pos. Command after com. pos. is taken, "*Trunk rotation left and right — óne!! Twó!! . . . Forward turn!*" . . .

To increase the effect of a rotation, the pupils may be kept in turn pos. while executing a 2 A. ext. For instance: —

Str. Turn Stride St. 2 A. Ext. Upw. (Fig. 180). — Command, "*Feet sideways place and arms upward — strétch! Trunk to the left — turn! Arm-extension upward — óne! Two! . . . . Trunk to the right — turn!*" etc.

Fig. 180. — Bd. Turn Std. St. 2 A. Ext. Upw.

In wlk. *a* position, it may be changed for advanced pupils as follows: Command, "*Left foot sideways forward, to the left, and arms upward stretch — óne! Twó!*" 1. Bend st. pos. 2. Str. turn walk *a* st. pos. — "*Arm-extension, change feet and sides — óne! Twó!*" . . .

½ Yd. Rch. Turn Std. St. T. Rot. with 2 A. Fling (Fig. 181). — This is a very difficult movement, used only for far advanced classes. For the commencing position, command, "*Left foot sideways — pláce! Trunk to the left — turn! Left arm sideways, right arm forward — strétch! Right hand — túrn!*" (Palm up.) For the movement, "*Trunk-rotation quickly, with arm-flinging and turning of hands — óne! Twó!*" . . . 1. The trunk is quickly rotated to the right, while the forearms are slightly lifted, the hands turned and flung to the right, until

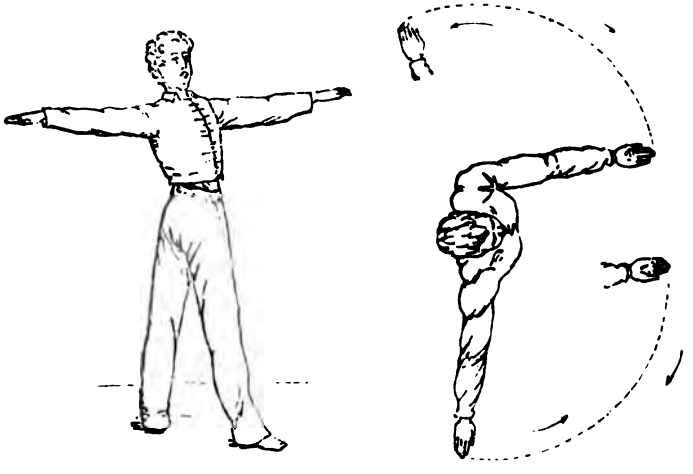


FIG. 181. — ½ YD. c RCH. TURN STD. ST. T. ROT. WITH 2 A. FLING.

the left arm comes into reach pos. with the palm up, the right into yard pos. with the palm down. 2. The movement is done on the same principles, to the other side. Before the movement reaches this complicated state, the rapid rotation should be practised alone in yd. std. st. pos., and the arm-flinging should be practised separately (as a shoulder-blade-movement).

The turn pos. can be exaggerated by backw. flex. of the trunk. For instance: —

Str. Turn Wlk. *a* St. T. Backw. Flex. (Fig. 182). — Command, "*Left (r.) foot sideways forward and arms upward — strétch! Trunk to the left (r.) — turn! Backward — bend! Upward — strétch! Forward — bend!*" . . . (see Fig. 183). The flexion occurs in direction of the face and occiput. This movement can be made exceedingly strong if the pupils remain in the backward flexion and execute arm-extension upward with change of feet and rotation to the opposite side. The movement is then called

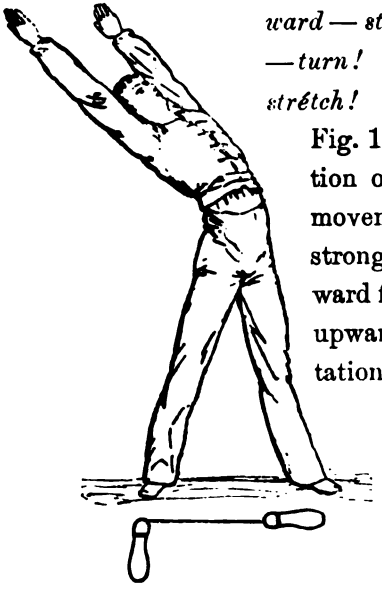


FIG. 182. — STR. TURN ARCH WLK. *a* ST. POS.

Str. Turn Arch Wlk. *a* St. 2 A. Ext. and Change of Feet. — After backward flexion is taken, command, "*Arm-extension, change feet and sides — óne! Twó!*" . . . 1. = Bend arch st. pos. 2. = Str. turn arch wlk. *a* st. pos. to the opposite side. This movement can be done only by very strong persons. At first the 2 A. ext. is done without change of feet.

FIG. 183.
WG. TURN ST. FORW. FLEX.

This form of lateral trunk-movement resembles closely the arch-flexions (oblique), and may be used as substitutes for these when there are no bar-stalls or other suitable apparatus at hand. (See "Arch-flexions.")

The simplest sideways flexion is

Close St. T. Sidew. Flex. (Fig. 184). — Command, "*Feet — clóse! Trunk to the left (r.) — bend!*" The trunk is slowly bent to the side named, the hands glide on the legs, the knees remain straight, and the head follows the movement of the shoulders. Common faults in all sideways flexions are: pushing one shoulder (in this case the right one) upward, and leaning the head against the shoulder, bending one knee, and bending the trunk forward or backward.[1] The trunk is slowly straightened at the command, "*Upward — stretch!*" To increase the force of the movement and thus to get a progression out of one and the same exercise, the arms are subsequently placed in ½ str. wg., rest, str., and yd. *c* positions. Wing position is used but little in sideways flexions (except for children). If ½ str. pos. is used, the flexion takes place to the left, when the right arm is extended upward, and *vice versa*. Besides close st., the position of the feet can be: stride st., st., wlk., *b* st., wlk. *c* st., and fall-out *b*. In the last three positions, the flexion takes place only to the side of the advanced foot. For instance: —

Fig. 184. — Close St. T. Sidew. Flex.

Str. Wlk. *b* **St. T. Sidew. Flex.** (Fig. 185). — Command, "*Left foot forward and arms upward — strétch! Trunk to the left — bend! Upward — stretch! . . . Arm-extension upward and change of feet — óne! Twó! Trunk to the right — bend!*" . . .

In any position, after commencing position has been ordered, the command for the flexion is invariably as described above, and the execution is slow.

[1] For further discussion of execution, see Appendix.

Advanced pupils may do rest stride st. and str. stride st. T. sidew. flex. (Fig. 186) rapidly instead of slowly.[1] Command, "*Left* (*r.*) *foot sideways place and neck — firm!* (or *Arms upward — strétch!*) *Trunk-flexion quickly, left* (*r.*) *and right* (*l.*) — *óne! Two!* . . . *Upward — stretch!*" . . .

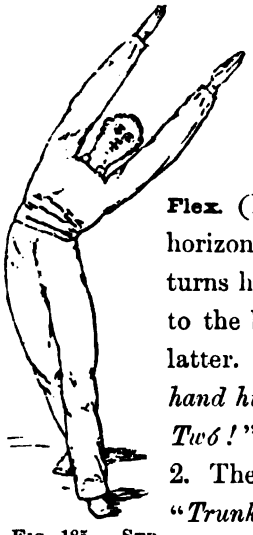


FIG. 185. — STR. WLK. *b* ST. SIDEW. FLEX.

½ Str. Wg. Side Sup. Wlk. *b* **St. Sidew. Flex.** (Fig. 187). — The pupil stands beside the horizontal bar, which is put at hip height. He turns his side — supposing in this case the left — to the bar and stands so close that he touches the latter. Command, "*Left foot forward place, left hand hip firm and right arm upward stretch — óne! Twó!*" 1. The right arm bends. 2. The position named is taken. "*Trunk to the left — bend! Upward — stretch!*" . . . The movement is also done from st. pos. and with the arms in yd. *c*, rest, or str. pos.

Foot Side Gr. St. T. Sidew. Flex. (Fig. 188). — In the foot side gr. st. pos. the pupil stands with his side turned to the stall-bars and one step away from them. The foot nearest the bars is inserted between the second and third rounds (or higher), both knees are straight, and the body in usual good posture. Trunk flexion

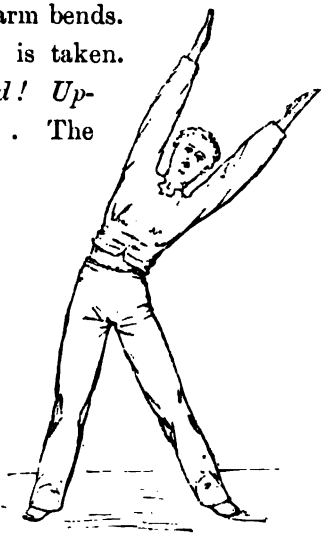


FIG. 186. STR. STD. ST. T. SIDEW. FLEX.

[1] The centrifugal force (penetrating energy) increasing with the speed of motion (as the square of the rate at which the velocity increases), a stronger contraction of the carrying muscles will be produced.

FIG. 187.—½ STR. WG. SIDE SUP. WLK. *b* ST. SIDEW. FLEX.

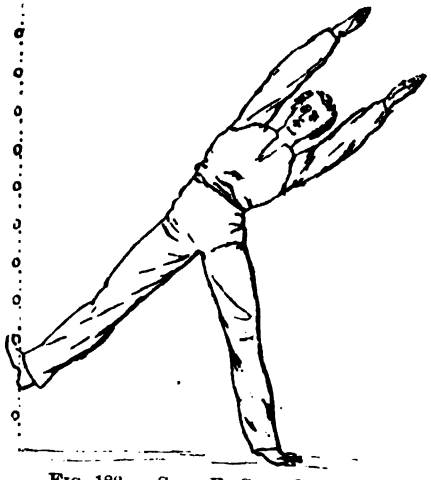


FIG. 188. — STR. F. SIDE GR. ST. SIDEW. FLEX.

FIG. 189. — STR. TURN STD. ST. SIDEW. FLEXION.

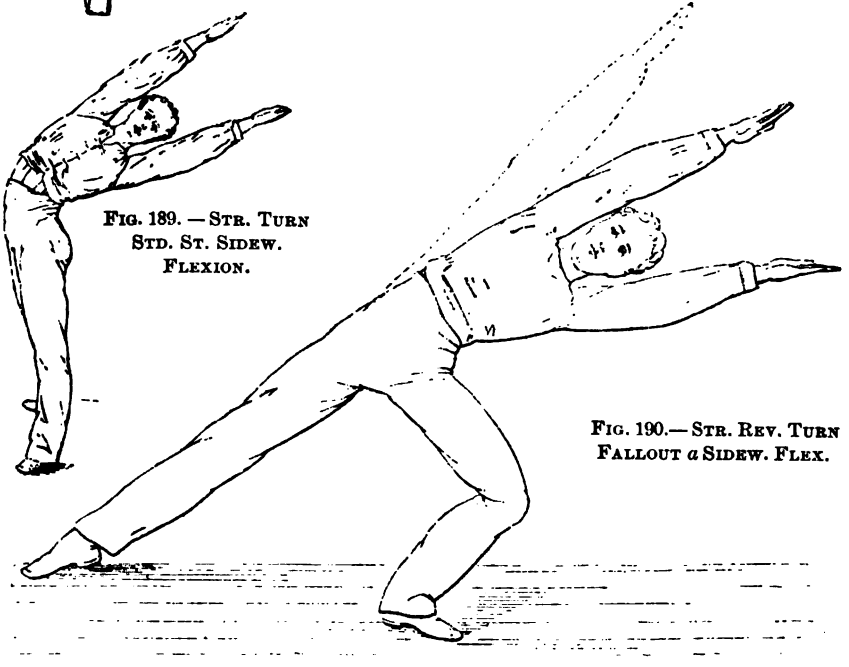


FIG. 190.— STR. REV. TURN FALLOUT *a* SIDEW. FLEX.

takes place in direction from the bars, both knees remaining straight. The flexion should not be deeper than that the trunk and elevated leg are in a line. The command is as described above, and the movement is done with the arms in wing, yd. *c*, ½ str. wg., rest, or str. pos. In absence of stall-bars the foot may be placed on the horizontal bar, or on a chair, or the knee of another pupil (compare Fig. 165), where the latter holds it in position. To secure firm posture, it is then best to have the supporting pupil in the ½ kn. st. pos.

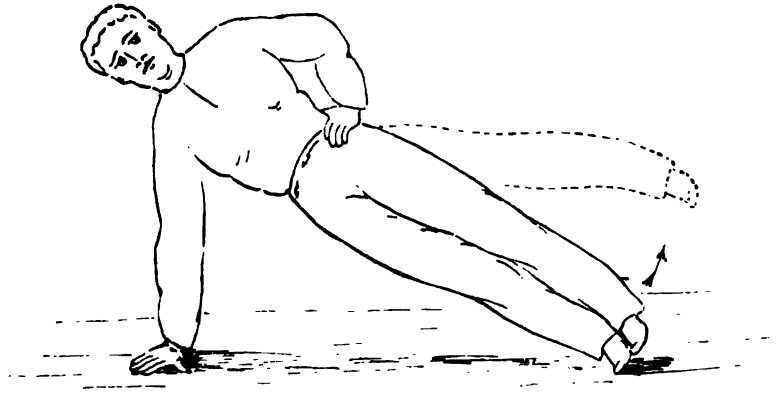


FIG. 191. — WING SIDE FALL L. ELEV.

If the sideways flexion is to be combined with rotation, the flexion is done to the side to which the trunk is rotated. The commands are, for instance, for

Str. Turn Std. St. T. Sidew. Flex. (Fig. 189).—"*Left foot sideways place and arms upward — strétch! Trunk to the left — turn! To the left — bend! Upward — stretch!* . . . *To the right — turn!*" . . .

Similarly: — **Str. Rev. Turn Fallout** *a* **T. Sidew. Flex.** (Fig. 190), and movements of the same type.

A common fault in these movements is to bend the trunk forward instead of sideways.

Side Fall. Pos. (Fig. 191). — To take this position, command, "*Side falling on the left hand — óne! Twó! Three!*" 1 and 2 are executed as stoop falling position (Figs. 167 and 168). 3. The right hand takes "hip firm," while the body is turned over (to the right), so that it rests on the left hand and on the outside of the left foot. The feet are in close pos. and the legs straight. *Change hands — óne! Two!*" . . . 1. Stoop fall. pos. 2. Side fall. pos. on the other hand. After this position has been practised for some time it is used as commencing position for leg-elevation.

Side Fall. L. Elev. (Fig. 191). — After commencing position is taken, command, "*Leg-elevation — one! Two!* . . . The upper straight leg is lifted as high as good posture will allow. The movement is also done in ½ str. side fall. pos. (Fig. 192), which may be considered easier. If the arm which is extended upward grasps a stall-bar (hor. bar, the hand of another pupil, etc.), the position is called ½ str. gr. side fall. pos., which naturally is easier to maintain than the same free position.

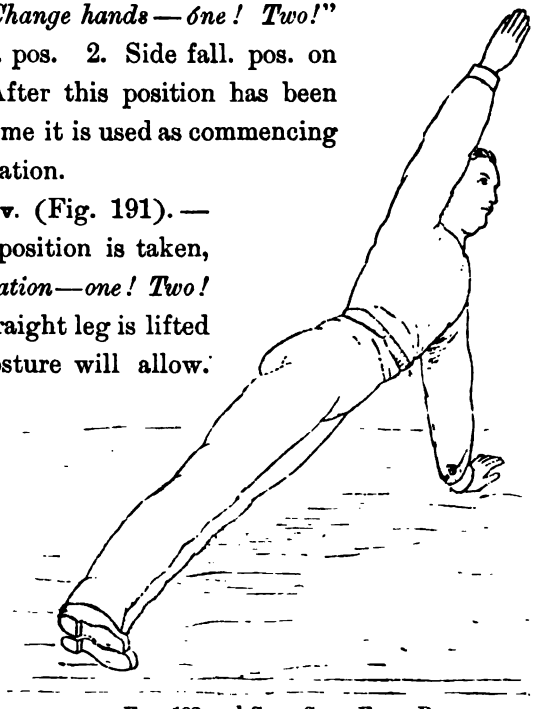


FIG. 192. — ½ STR. SIDE FALL POS.

Rest Side Sup. St. Sidew. Flex. and L. Elev. — The pupil stands close to the horizontal bar, put at hip height, with his side turned to the bar and touching it. Command, "*Neck — firm! Trunk-flexion, leg-elevation — óne! Two!*" . . . The pupil

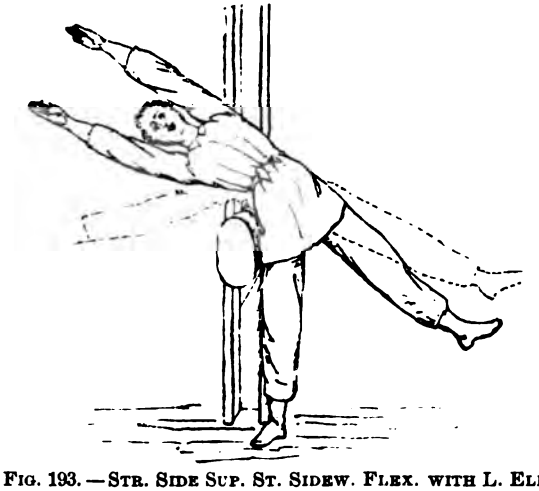


FIG. 193. — STR. SIDE SUP. ST. SIDEW. FLEX. WITH L. ELEV.

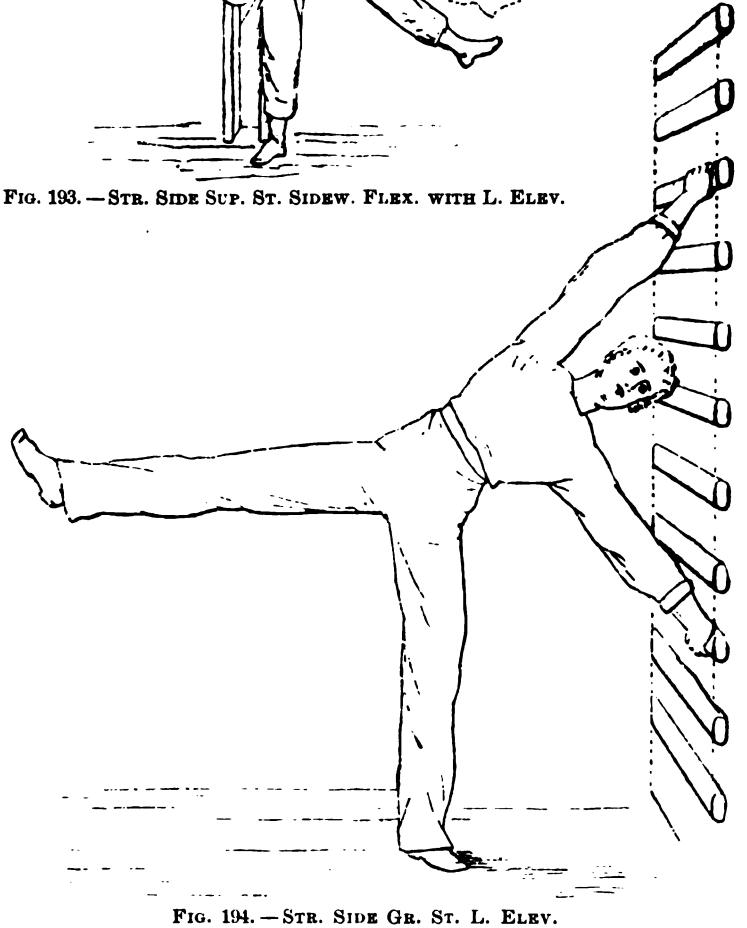


FIG. 194. — STR. SIDE GR. ST. L. ELEV.

bends over the bar, keeps the leg nearest it straight, and lets the other rise as the trunk bends, so that this leg and the trunk are in a line. (Compare Fig. 193.)

Str. Side Gr. St. L. Elev. (Fig. 194). — The pupil stands one step away from the stall-bars, his side turned to them. Command, "*Arms upward — strétch! Trunk to the left (r.) — bend! Grásp!*" The trunk is bent toward the bars, and each hand grasps a bar, so that the arms are straight (the upper arm remains in str. pos., whereas the lower, to become straight, must be lowered into yd. *d* pos.; this hand is supinated). The leg nearest the bars is vertical and straight. The foot of the other leg is raised above the floor. "*Leg-elevation — óne! Twó!*" . . . The outside leg is raised and lowered.

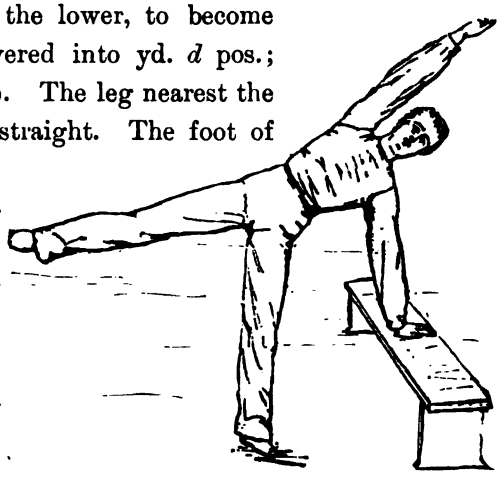


FIG. 195. — INTRODUCTION TO WHEELING.

Introduction to Wheeling (Fig. 195). — The pupil stands one step away from a bench, with his side turned to it. Command, "*Right (l.) foot sideways and arms upward — strétch! Trunk-flexion to the left (r.) — óne! Twó!*" . . . 1. The pupil bends to the left (r.); at the same time he raises his right (l.) leg, and lowers his left (r.) arm until his left (r.) hand rests on the bench (the position is like str. side gr. st. L. elev.). 2. He resumes str. stride st. pos.

Before wheeling is attempted,

Rest St. T. Sidew. Flex. with L. Elev. may be tried. Command, "*Neck — firm! Trunk-flexion left and right, leg-elevation — one!*

Two ! Three ! Four !" . . . 1 and 3. = Flexion to the side, the opposite leg rising proportionately. 2 and 4. = Rest st. pos. The movement may also be done from wg., ½ str. wg., yd. *c*, and str. pos.

Wheeling (Fig. 196). — Command, "*Feet sideways place and arms upward — strétch ! To the left* (*r.*) *— whéel !*" The pupil

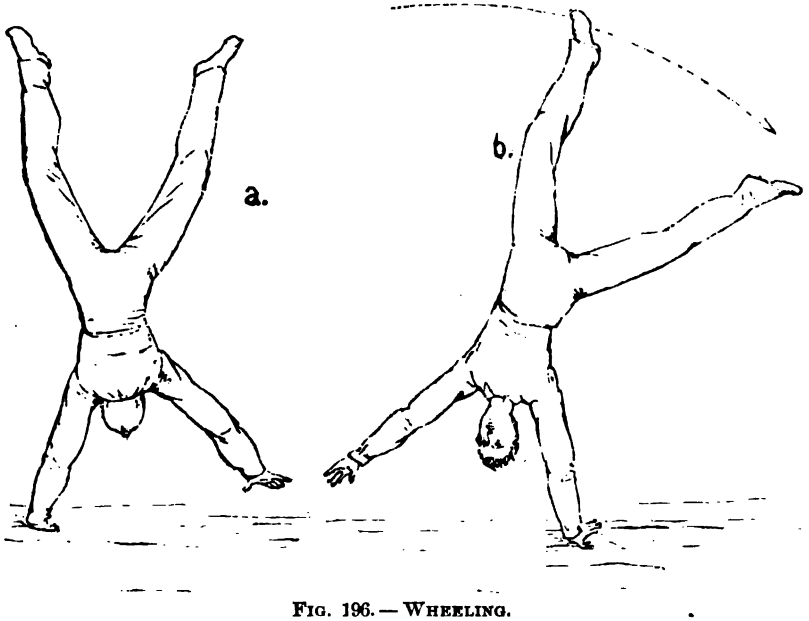


FIG. 196. — WHEELING.

bends his trunk slightly to the right (l.), and then with utmost speed to the left (r.), until his left (r.) hand rests on the floor; his right (l.) hand is placed on the floor beyond the left (r.) one; his feet, having left the floor, describe a semi-circle in the air, and land on the floor beyond his right (l.) hand. By this time his hands have left the floor, and he stands in str. std. st. pos. The motions of arms and legs resemble the spokes

of a revolving wheel. The hands should not touch the floor simultaneously, nor should the feet, but the movement should be a distinct "one — two — three — four." Legs as well as arms are kept straight throughout the movement. When practised for the first time, the pupils may be allowed to bend slightly forward, and, already in the commencing position, to lower the hand in whose direction the wheeling is to be done. As soon as every pupil has gained some proficiency, the class is arranged in one rank, the pupils standing behind each other at "whole distance." After they have been numbered by twos from the front backward, command, "*Feet sideways place and arms upward — stretch! Numbers one to the left, numbers two to the right — whéel!*" The ones and twos do the movement in opposite directions, as ordered. "*Into places — whéel!*" The pupils wheel back into their original places. The movement must take place strictly sideways, or accidents will happen (the gymnasts interfere with each other); consequently wheeling must not be tried in class until after considerable individual practice.

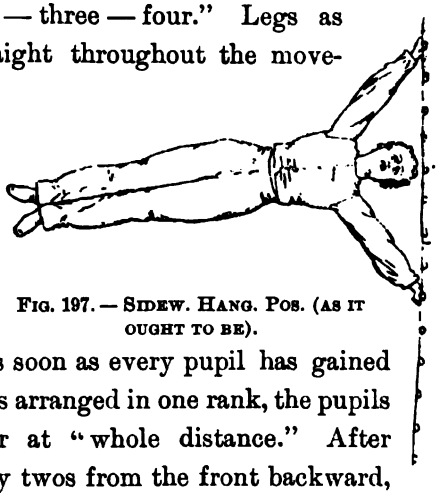


FIG. 197. — SIDEW. HANG. POS. (AS IT OUGHT TO BE).

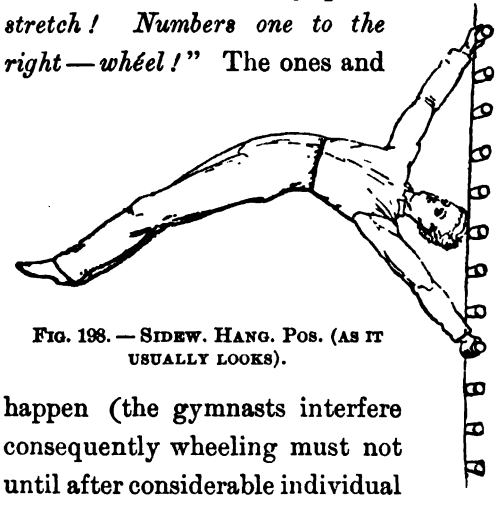


FIG. 198. — SIDEW. HANG. POS. (AS IT USUALLY LOOKS).

Sidew. Hang. Pos. (Fig. 197). — The pupil stands at the barstall with his side turned toward the wall and one step away from

it. Command, "*Arms upward — strétch! Trunk to the left* (*r.*) *— bend! Grásp!* (see Fig. 194). *Sideways hanging — place!*" The pupil swings both his legs up, and holds himself out from the bars by means of his arms alone. Arms and legs are straight, and the body stands out at right angles from the bars. The pupil stays in this position as long as his strength will allow, and then lowers himself slowly into commencing position. Beginners may learn to take this position by first taking the str. side gr. st. pos. with elevated outside leg. This leg is now lowered with utmost speed (and allowed to pass in front of and on the other side of the inside leg), and immediately swung back again as high as possible, the inside leg following close to it. The upper arm may at the same time be bent; and, as the body is lowered into horizontal position, it is straightened. Advanced pupils get into the position by merely elevating their legs with moderate speed until they are horizontal. This, however, requires a high degree of physical development. A common fault in this exercise is turning the face obliquely upward, and curving the body and legs (Fig. 198); in fact, there are but few who reach the ideal in this position.

(Such movements as "scissors," "spider-walk," etc., on parallel bars should be considered as lateral trunk-movements.)

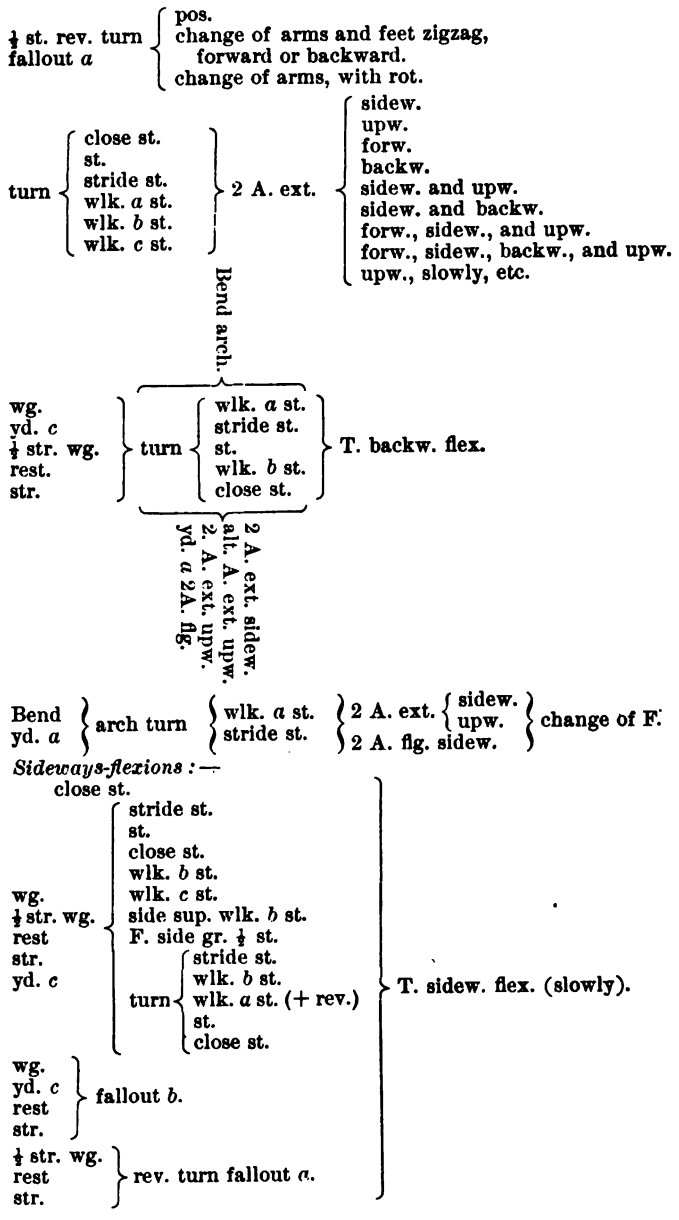
Synopsis of lateral trunk-movements arranged by commencing positions: —

Rotations: —

wg. / yd. *c* / rest / str. — close st. / st. / stride st. / walk. *a* st. (also rev. rot.) / wlk. *b* st. / wlk. *c* st. (also rev. rot.) / fallout *a* (also rev. rot.) — T. rot. (slowly).

yd. *c* / str. — stride st. quick T. rot.

½ yd. *c* rch. turn std. st. quick T. rot. with 2 A. fig.


½ st. rev. turn fallout a
pos.
change of arms and feet zigzag, forward or backward.
change of arms, with rot.
turn
close st.
st.
stride st.
wlk. a st.
wlk. b st.
wlk. c st.
2 A. ext.
sidew.
upw.
forw.
backw.
sidew. and upw.
sidew. and backw.
forw., sidew., and upw.
forw., sidew., backw., and upw.
upw., slowly, etc.
Bend arch.
wg.
yd. c
½ str. wg.
rest.
str.
turn
wlk. a st.
stride st.
st.
wlk. b st.
close st.
T. backw. flex.
2 A. ext. sidew.
alt. A. ext. upw.
2. A. ext. upw.
yd. a 2A. flg.
Bend yd. a
arch turn
wlk. a st.
stride st.
2 A. ext.
sidew.
upw.
2 A. flg. sidew.
change of F.
Sideways-flexions :—
close st.
stride st.
st.
close st.
wlk. b st.
wlk. c st.
side sup. wlk. b st.
F. side gr. ½ st.
turn
stride st.
wlk. b st.
wlk. a st. (+ rev.)
st.
close st.
wg.
½ str. wg.
rest
str.
yd. c
T. sidew. flex. (slowly).
wg.
yd. c
rest
str.
fallout b.
½ str. wg.
rest
str.
rev. turn fallout a.

rest, str. } stride st. quick T. sidew. flex.

½ str. gr., ½ str., wg. } side fall. { pos., L. elev.

wg., ½ str. wg., rest, str., yd. *c* } side sup. st., st. { T. sidew. flex. with L. elev.

Introduction to wheeling.
Wheeling.

Synopsis: —

JUMPING AND VAULTING.

LEAPING.

- *Aim:* Develop general co-ordination. Control and speed.
- *Contents:* Running. Jumping. Vaulting.
- *Types:* Jump with whole, half (or double) start. Vault with whole, double, or half start.
- *Effects:*
  - Physical.
    - Develop elasticity.
    - Develop extensors of leg.
    - Increase peristalsis.
    - Increase blood-pressure.
  - Physiological.
    - Increase exhalation.
    - Increase elimination of CO_2.
    - Increase metabolism.
  - Psychological.
    - Improve cerebral localization
    - Produce courage.
    - Produce appreciation of (space, time) effort.
    - Produce presence of mind.
    - Produce exhilaration.
- *Progression:* Standing, Running } jump, vault.
- *Limitations:*
  1. Are never introductions.
  2. Quantity and quality to be proportioned to rest of lesson.
- *Relations:*
  1. Evolution of all other movements in same and preceding lessons.
  2. Merge into
     - heaving-movements.
     - abdominal exercises.
     - arch-flexions.
     - Lat. T. movements.
  3. Hopping = continuous balance-movement.

The exercises commonly known as jumping and vaulting not only have numerous educational effects warranting their use, but they are also of great practical value for purposes of ordinary every-day life. For it is well, when obliged to jump, to know how to accomplish the movement with the least expenditure of energy, and also how to break the fall by a correct use of the muscles, instead of meeting the concussion by the bones alone. Fractures, sprains, and jarring of the spine, do not result from jumping when one has learned how properly to land, while with the untrained such occurrences are frequent.

In the practice of these exercises the question is less how high to jump, more in what manner is it to be done, and especially how should the landing occur.

The knee-joint is so shaped that, when the knee is straight, the surfaces of the condyles fit very accurately into the facets of the head of the tibia; and the first part of a knee-flexion takes place slowly. The radius of the condyle is decreasing backward, so that, after flexion has once begun, it occurs easily and with accelerating speed. Now, in jumping, if the landing is made with straight knees, the facets of the knee-joint are pressed forcibly together, so that flexion becomes impossible, and the thighs and hips suddenly oppose the downward movement; but gravitation cannot be thus suddenly overcome, and the body still remains for a while under the influence of the fall; the neck of the femur has to resist the pressure from above, and, if the speed of motion is great, the bone will break; the internal organs also continue to move downward, and the ligaments, etc., by which they are suspended, will thus be excessively stretched, until the fall is broken — displacement is often the result. On the other hand, if the knees have

already commenced to bend, when the feet strike the ground, they continue to do so until the fall is wholly broken, and the motion is gradually reversed through the elasticity of the quadriceps extensor, etc. For ordinary height and speed, all danger of fracture and displacement is now removed. The heels should be raised when the feet strike the ground, so that the gastrocnemius may also help to break the fall. Furthermore, the heels should be held together and the feet turned out; for, in this position, the neck of the femur acts like an oblique beam, distributing the pressure throughout the whole bone, whereas, when the heels are apart, the neck is horizontal, and hence easily broken. Besides, the position lessens the danger of internal displacement. If done in this way, there is no need of a mattress to land on when ordinary jumping is practised. In prolonged or violent vaulting, and when jumping takes place from great heights, a mattress may be used as a safeguard against accidents and to prevent the feet from becoming sore. On any other occasion, the use of a mattress will tend to ruin the form of the movement and to take away its best effects.

In jumping, the body is propelled by the feet alone, the arms merely adding momentum by oscillating in the direction of motion, and balancing the thorax at the landing; in vaulting, during the intermediate portion of the movement, the body is balanced on the hands, so that the direction of motion of the legs may change from rectilinear to curvilinear, the feet describing an arch or "vault."

Running consists of a rapid succession of jumps from one foot to the other; and for that reason its effects resemble those of jumping, as described below. Also, instead of introducing running in the middle of the lesson, it may appear later as a preparation for the jumping and vaulting. As a matter of

convenience the three forms of movement may be included under the one heading "leaping."

When the body is sprung from the ground by both feet, from standing pos., the jump is said to occur with "whole start;" when by one foot from standing or running with "half start;" and when by both feet from running, as in running face vault, leap-frog, etc., with double start. The double start is used in jumping only for free somersaults (and for diving purposes); and the whole start should precede the half start. In vaulting, whole start is used first, half start last, and double start will be the most common form, since vaulting is best done from a running start.

If the effort is to be for height, a short run is best, — just enough to gain muscular control, — for here the rapidity with which the last step is taken largely determines the height attained; if the effort is one for distance, the run should be longer, so that when the feet finally leave the ground the body may have gathered the greatest horizontal momentum. In standing vault, the body is largely lifted over by the pull from the hands; in running vault, the hands strike later than the feet, and merely support the trunk.

In all jumping and vaulting, the landing should take place on both feet, as described above (Fig. 201). In continuous side vault over bar (Fig. 227), however, it occurs on one foot, the mechanics otherwise being the same as for landing on both feet.

Leaping requires for execution a high degree of elasticity, and its continued practice will consequently develop this quality in the body. The extensors of the legs are being used for contractions and relaxations in rapid sequence, and the speed and power of these muscles will grow in such a

manner as to produce an elastic step in walking. This is still more emphasized by the increase of arch of instep resulting from the shortening of the plantar muscles by their constant and forcible use in these movements.

The shaking of viscera in continued leaping will have the effect of a mechanical irritant to produce an increased secretion of bile and a livelier peristalsis, even to causing diarrhœa. In this respect it is even more powerful than horseback riding; for in the last-named exercise the pounding on the saddle causes pelvic congestion enough to offset some of the effects produced on liver and intestines.

The jarring of the lungs, heart, and large vessels, as well as the rapid accumulation of carbon dioxide in the blood, resulting from the contractions of the large masses of muscles of the legs, soon produces pulmonary congestion and an increase of general blood pressure and heart-beat. There is an increase of respiration, so that the carbon dioxide may become eliminated with greater rapidity; the exhalations become more rapid and forcible. There is, however, no *proportionate* increase of inhalations,[1] so that it would be an error to suppose that leaping increases the chest capacity; and we also know that the boy of phthisical or contracted chest usually makes a good jumper — which may in some degree depend on his expiratory strength.

The hastened circulation causes an increasing skin-evaporation; and considering also the effects on digestive and respiratory organs, these exercises may well be spoken of as movements of elimination; and as such they are of great

[1] The time of inhalation may be longer than that of exhalation, but the latter is far more forcible and of greater volume. (Compare Lagrange for opposite version of this question.)

value when it is desirable rapidly to affect the general metabolism.

To jump or vault, a great number of muscles have to be brought into play simultaneously, each one contributing an exact degree and speed of contraction for the consummate action. This means that a great number of motor impulses have to be generated and co-ordinated in a very exact, manner. In fact, the execution of the movement depends much more upon the mental skill than upon muscular strength; and its practice will also show a marked increase of ability of cerebral localization of effort and of co-ordination, manifesting itself as a general quality of the mind. The movements cultivate control in the form of executive attention, rather than the expectant attention — active repose — as produced by balance movements.

While heaving-movements produce a consciousness of power — a courage of being, — such exercises as the more complex forms of vaulting and jumping cultivate the courage of doing. Besides, the last-named exercises develop presence of mind, or the ability of turning a quickly conceived idea into as rapid an action; for a rapid transmission and co-ordination of impulses is a necessity in these movements, and even though primarily developed for locomotion, the ability will appear as a general mental characteristic.

Skill in vaulting and jumping depends on ability to gauge the effort according to space and time; and it produces in the gymnast the habit of making exactly the effort required — no more, no less: he learns to save energy by properly appreciating the necessary "launching effort" of attention for any definite deed.

A forcible sensory impression received on a small surface is

conceived as pain, while if the same amount of force is distributed over a larger surface, so that numerous small impressions become transmitted at once, it is conceived as "a large, massive impression," — one of pleasure, of exhilaration. Muscular movements produce sensations of motion in such a manner that when a strong exercise is well localized, as for instance in shoulder-blade-movements of localization, it produces a sensation of pain; while if the exercise is more generalized, so that many muscles each contribute a little toward the movement, a large, massive impression is received, and the exercise produces exhilaration. In that manner leaping becomes exhilarating, as will also any general exercise done with full volition. This exhilaration from vaulting is well known to all gymnasium instructors, although they may not have understood the reason for it, beyond that of the satisfaction which all experience in overcoming a difficulty — in this case that of getting over the obstacle in good form and doing a little better than the other members of the class.

The simpler forms of jumping should precede vaulting; and standing jump and vault should precede the corresponding running movements. In other respects the progression depends largely upon individual skill. And it might be said that skill in these movements well indicates the physical culture of the individual, since it expresses his ability of control for execution — of correctly doing that which has been correctly conceived.

Leaping cannot very well appear among introductions, since in that part of the lesson the pupils do not possess the necessary co-ordination, which, on the other hand, gradually develops during the lesson and reaches its acme toward the end. In that manner jumping and vaulting may be said to be the evolution of all other exercises in the same lesson, and necessarily also

from those of all preceding lessons. Moreover, it is highly undesirable in the beginning of the lesson to increase the blood-pressure, heart-beat, and expiration in so forcible a manner; and consequently we cannot approve of the German method of beginning the lessons with (marching and) running.

Vaulting between double bars, over bar with a rope, pole vault, etc., are heaving-movements as well as leaping; and when they are used, the second heaving-movement may be excluded from the lesson. Many of these exercises also include the effects of lateral trunk-movements and abdominal exercises, and almost all vaulting depends for good form on an effort of arch-flexion during the intermediate portion of the movement. Thus, that holds good which has been stated before, that the more complex an exercise grows, the more it embraces the effects from several classes of exercise.

The hopping-movements described below are used as easy forms of jumping, although they are in reality continuous balance-movements — very rapid (2) heel elevations — the typical characteristic of jumping, the sudden extension of the knee, being absent.

The physical and physiological effects of running are very similar to those of repeated jumping, but the psychological effects — with exception of the exhilaration — are very much less marked.

The number, complexity, and force of the jumping and vaulting exercises should be proportioned to the rest of the lesson; and it is well to let the quantity of running correspond to the severity of the vaulting, as it will always be found that the latter improves from a sufficient run applied in the preceding part of the same lesson.

In applying jumping, it is well to remember the relation of

bone-structure and age, so that deformities (in the young) and fractures (in the old) may not result from the exercises.

Preparation to Jumping (Fig. 36). — Command, "*Prepare to jump — óne! . . . Fóur!*" . . . The execution is like that of st. 2 Kn. flex. (see leg-movements). At first the movement is practised with hips firm, later without it, the arms hanging straight behind the thighs when the knees bend. From time to time the teacher changes the rhythm of this movement ("*— one⁀two! — Thrée! — Fóur!*" or "*— óne! — Two⁀thrée! — Four!*" etc.), so that the pupils become thoroughly balanced in each one of the intermediate positions. After some time, the teacher leaves off counting, and merely commands, "*Preparation to jumping — stárt!*" when the pupils go through the whole movement. When it is done in this way, the teacher may occasionally and unexpectedly say, "*Twó!*" (or "*Thrée!*" etc.), when the pupils understand that they are to stop in the position belonging to that count. This is an excellent way to make the pupils well balanced in the intermediate positions. After this movement can be well performed, it is safe to proceed to the next one; yet the preparation to jumping should be applied in almost every lesson; for, no matter how skilled the pupils may be, the movement always retains its effect of correcting the form of all jumping and vaulting. It may then be used as an introduction or as a slow leg-movement, since it shares the effects of the latter kind of exercises, even though it is done in rapid rhythm.

Upw. Jump (Fig. 199). — Command, "*Upward jump — óne! Twó! Thrée! Four! Five!*" 1. 2 Heel elev. 2. 2 Kn. flex. to 90°. 3. By a rapid extension of his knees, the pupil jumps straight up; and, in the same place where he stood before, he lands on tip-toe with raised heels, and lets his knees bend to

right angles; in this position he stays with erect trunk and head, and arms hanging straight behind his thighs. 4. The knees are stretched. 5. The heels are lowered. This movement should never be done with "hips firm;" for what is gained by the knee-flexion in landing is apt to be lost by the pressure exerted by the hands on the hips.

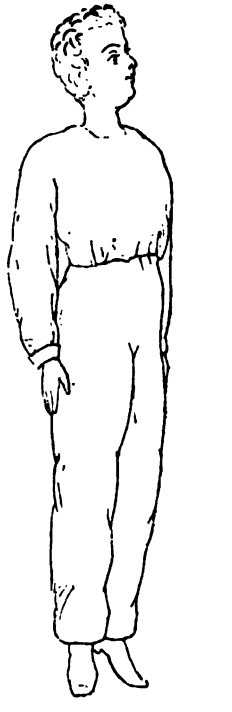


FIG. 199.
UPW. JUMP: "THRÉE!"

Turn. 90° Upw. Jump. — Command, "*Turning* 90° *to the left* (*r.*), *upward jump — óne! . . . Five!*" The movement is executed as the one just described, except that, as the pupil jumps, he turns 90° to the side ordered, and faces in this new direction when he lands. [Later on 180° (and even 360°) may be tried.]

With A. Fling. Upw. Jump. — Command, "*Arms flung sideways, upward jump — óne! . . . Five!*" This resembles upward jump; but, as the pupil jumps, he flings his arms straight sideways to horizontal position, thus aiding the motion upward. The arms move quickly down again, so that they are in the usual position when the landing occurs.

With A. and L. Fling. Upw. Jump. — Command, "*Arms and legs flung sideways, upward jump — óne! . . . Five!*" At the jumping, arms and legs are flung out sideways, and brought back into position again, so that the arms are perpendicular, and the heels together, when the feet strike the ground.

Forw. Jump (Figs. 200 and 201). — Command, "*Forward jump — one! . . . Five!*" 1. 2 Heel elev. 2. 2 Kn. flex. and the arms are moved backward into backw. rch. pos.[1] 3. Keeping his heels together, the pupil jumps forward, and helps the movement by swinging his arm straight forward into reach pos. The arms swing back again; and, by keeping them rigid behind the thighs when the landing occurs, the body is prevented from falling forward. 4. Knees stretch. 5. Heels sink.

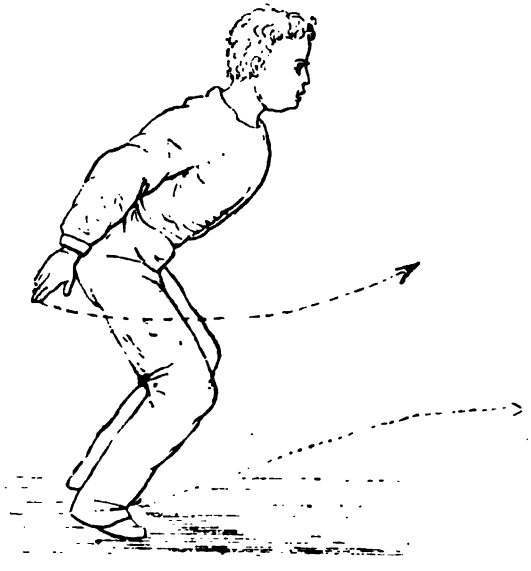


FIG. 200. — FORW. JUMP: THE START.

Backw. Jump. — On the same principles, jumping can be done backward; this movement, however, is of less value, and is but little used.

Sidew. Jump. — Command, "*To the left (r.) jump — one! . . . Five!*" This is executed on the same principles as forward jump, except that, just before jumping, the pupil swings his straight arms in front of him to the side opposite the one to which he is jumping; and, as he jumps straight to the side, the arms are flung in direction of the jumping, and brought into the usual position at the landing, so as to prevent the trunk from tipping over.

[1] It is better to close the hands firmly, instead of keeping them open as shown in the illustration.

Later these jumps may be practised with a command for only the first and last part of the movement. For instance, command, "*Upward — júmp! Five!*" The pupils go through the first four parts with utmost speed. Before this, however, the movement should be done as, "*Upward — júmp! Fóur! Five!*" the pupils stopping at the landing.

The jumping may also be practised with the knee-extension done so quickly that it creates another jump. Command "*Twice upward jump — óne! . . . Six!*" or "*Turning* 90° (180°) *and back to the right to the left* (*r.*) *jump — óne! . . .* (*l.*), *twice upward left* (*r.*) *and right Six!*" or, "*To the* (*l.*) *jump — óne! . . . Six!*" etc.

Forw., sidew., and backw. jump may be done over a rope or other obstacle, first to counts, later to the command "*Stárt!*"

All the above jumps are done from whole start. Examples of jumping with half-start are the following: —

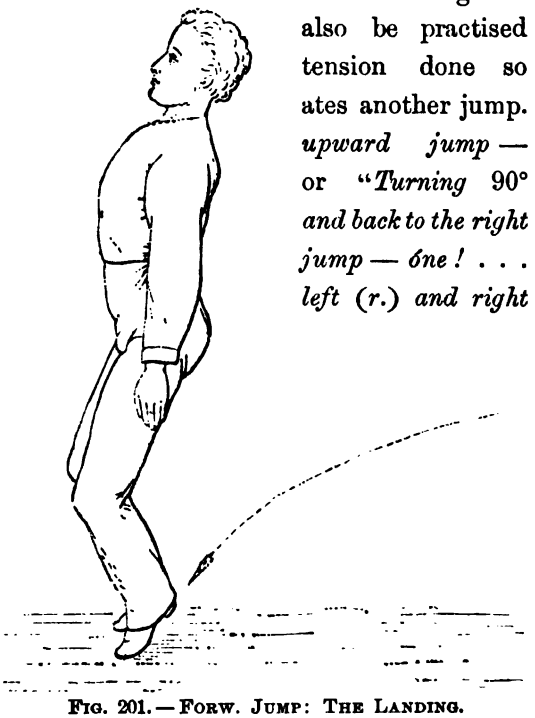


Fig. 201. — Forw. Jump: The Landing.

One Step's Start Forw. Jump (Fig. 202). — Command, "*Left* (*r.*) *foot forward, forward jump — one ⁀twó!! Three! Four!*" 1. The left (r.) foot is placed forward in walk *b* st. pos. 2. (Follows instantly.) The right (l.) leg and both arms are swung forward with utmost speed, while the left foot springs from

the ground, and the body is thrown forward; the heels are brought together, and landing takes place in usual form. 3. Knees stretch. 4. Heels sink. The movement is repeated from each foot alternately, so that the pupils become equally skilled in using either for the start. At first the distance jumped should be small, so that the landing may not lose its correct form. Later on, two or three steps are used for the start. For instance —

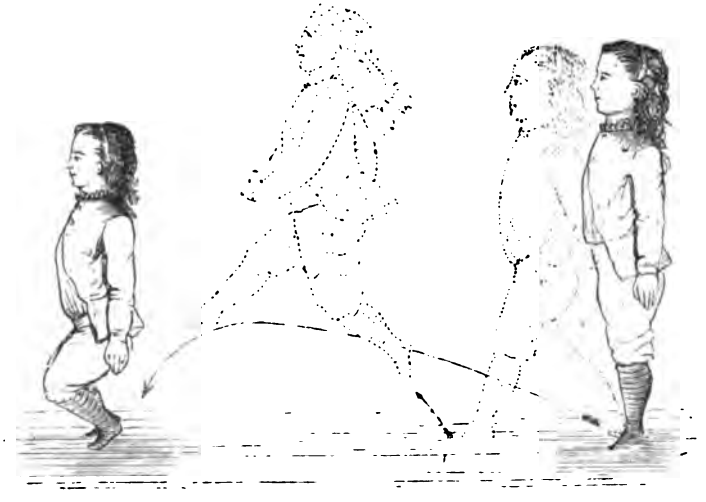


FIG. 202. — ONE STEP'S START, FORW. JUMP.

Three Steps' Start, Forw. Jump. — Command, "*Three steps' start; begin with the left* (*r.*) *foot, forward jump — one ⁀ two ⁀ thrée ! ! Four ! Five !*" (or — "*stárt ! Four ! Five !*"). The third step is the "half start" for the jumping, executed as above. After three steps have once been used, the movement is always done in this way, as one or two steps do not produce the speed that should characterize jumping.

This form of jumping may also be done with 90° turning;

the turning is then to the side of the foot which gives the final start. For instance: —

Three Steps' Start, 90° Forw. Jump. — Command, "*With* 90° *turning and three steps' start, beginning with the left* (*r.*) *foot, forward — júmp! . . . Four! Five!*" The pupils face to the left (r.) when they land. If the start had been with two steps, they would have faced to the right (l.), etc.

The jumping may also be done sideways forward, and then always with one step's start: —

Sidew. Forw. Jump. — Command, "*Forward to the left* (*r.*) *jump — one two! Three! Four!*" 1. The right (l.) foot is placed crosswise forward to give the start. 2. (Follows instantly.) By swinging the left (r.) foot in its own direction, and sending the right (l.) foot from the ground, jumping takes place sideways forward to the left (r.); landing is done as usual (with heels together, etc.). 3. Knees stretch. 4. Heels sink.[1]) This form of jumping is one of the most graceful movements known.

In jumping with "half start," — running free jump, — the teacher soon leaves off counting the separate movements, and commands only the start and the last two parts (knee-extension, and lowering of the heels).

Running Long or High Jump. — When proficiency is gained in these movements, two marks are made on the floor to indicate the distance to be jumped; and a rope is used to mark off the height for high jump. The distance or height should not be so great that the jumping cannot be done in correct form. When jumping over a rope (or other obstacle) the pupil should jump straight forward, — not with legs swinging to one side, —

[1] Similarly, *sidew. jump w. ½ start* may be done, the foot moving through stride crosswise st. pos.

and bring his heels together already before passing the rope (Fig. 203).

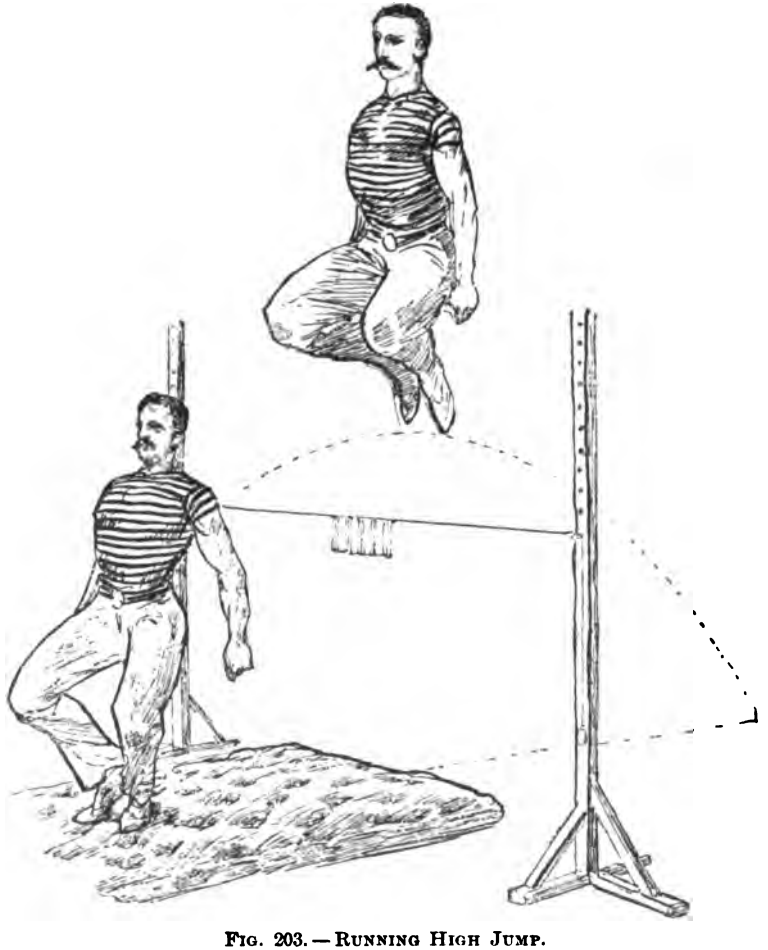


FIG. 203. — RUNNING HIGH JUMP.

The running high jump may be done with arms and legs flung sideways (Fig. 204), and also with arms and legs swung backward (Fig. 205), the last-named movement being both hand-

some and difficult. The heights attained will not be as great in these two exercises as in ordinary run. high jump. Besides being suitable for advanced pupils, they form good introductions for the outside and inside pommel-vaults described below.

In running long or high jump the teacher should decide which foot is to give the final spring. The pupils are arranged in one rank behind the rope (or marks on the floor), and face to the

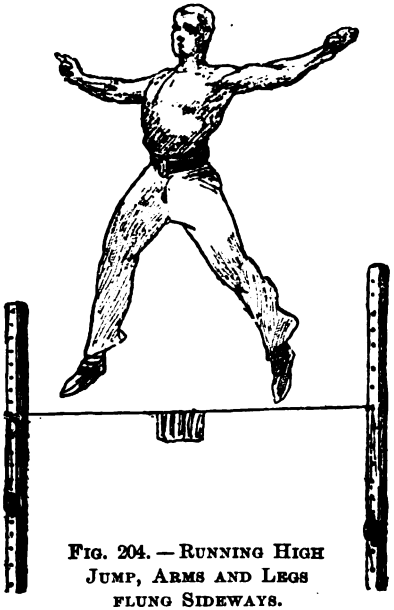


FIG. 204. — RUNNING HIGH JUMP, ARMS AND LEGS FLUNG SIDEWAYS.

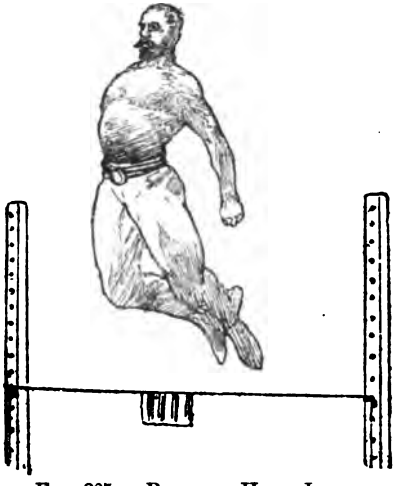


FIG. 205. — RUNNING HIGH JUMP, LEGS SWUNG BACKWARD.

flank. The teacher commands, "*Stárt!*" and the first pupil runs, jumps the rope, and, after landing, stretches his knees; he stays in toe st. pos. until the teacher commands, "(*Next* —) *stárt!*" when he lowers his heels, and marches away to place himself in the rank behind the others, etc. Occasionally the pupils may be ordered to run and jump as fast as there is room, the whole class running at the same time, and continuing

to jump one after the other until the teacher commands, "*Stóp!*"

Jumping from a Height (Fig. 206). — The pupil stands on a bench (or other elevation). Command, "*Left* (*r.*) *leg forward — lift!*" The leg is lifted far enough forward to be outside the bench. "*Downward — jump!*" The pupil jumps down and lands as usual. "*Thrée! Four!*" 3. Knees stretch. 4. Heels sink. The pupil may be allowed to bend slightly the knee of the leg which gives the start, especially if the height be great. This slight knee-flexion just before jumping also gives more grace to the movement. The pupil must not look down when jumping; for, if he does, he loses his balance when landing.

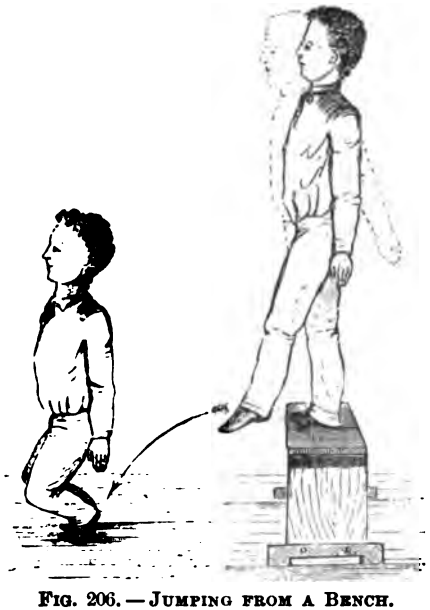


FIG. 206. — JUMPING FROM A BENCH.

Star Gr. St. Jump from Stall-Bars (Fig. 207). — The pupil stands with one foot on the fourth or fifth bar, grasps with the hand of the same side a bar above his head, and holds himself out sideways, the other arm and leg being elevated sideways, so that the position of the limbs resembles the points of a star. Command, "*Downward jump — one two!! Thrée! Four!*" 1. The free arm and leg are swung in to the body. 2. They are again swung sideways, and, at the same time, the other foot and hand leave the bars, and the pupil jumps down sideways and lands

as usual (facing as before jumping). 3. Knees stretch. 4. Heels sink.

Before the jump is tried, the arm and leg elevation may be practised as a lateral trunk-movement.

Wg. Toe St. Stride Jump. — Command, "*Hips — firm! Heels — lift! Stride jump — one! Two! . . .* (or — *Start! . . . Stop!*)." 1 = Wg. stride toe st. 2 = Wg. toe st. The change from one position to the other is taken by jumping with the slightest knee-flexion; and the movement is repeated in rapid rhythm for a minute or two. Care should be taken not to give it too long duration, as it forcibly and rapidly increases the heart-beat. It should be followed by a slow leg-movement. A similar movement can be done from wlk. *a* (*b*, *d*), toe st. pos. by changing feet by jumping without stopping in fund. pos. These exercises are quite suitable for little folks, both for amusement and to cultivate co-ordination and rhythm.

FIG. 207.
STAR GR. ST. JUMP FROM STALL-BARS.

Wg. Stride Toe St. Upw. Jump, Feet Striking. — Command, "*Feet sideways place and hips — firm! Heels — lift! Quick jump, feet strike — one! Two! . . . Position!* (or — *Start! . . . Stop!*)." The pupils jump straight upward, strike the feet together, and land in wg. stride toe st. pos. with slightly bent knees, and use the landing as start for another jump, etc.

The rhythm of this movement is somewhat slower than that of the preceding one, and the knees flex more at landing.

Similarly, L. elev. sidew. (forw., backw.) (see Balance-movements) may be changed into a jumping exercise, by letting the change of feet occur rapidly and repeatedly to one count.

FIG. 208. — INTROD. TO VAULTING: THE MOMENT BEFORE JUMPING.

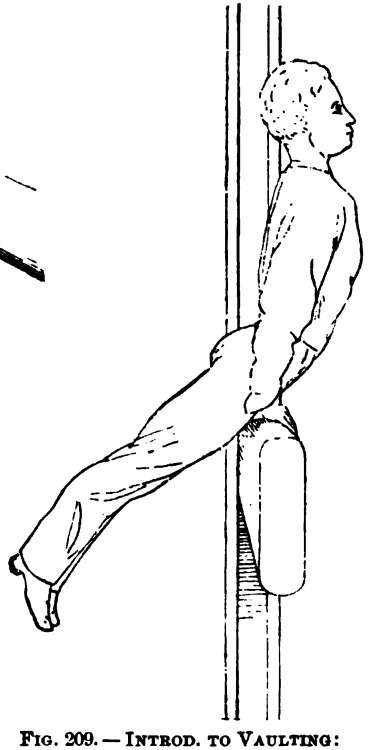


FIG. 209. — INTROD. TO VAULTING: "TWO." BAL. HANG. POS.

Hopping. — This is done from toe st. pos. at the command, "*Hopping forward (backw.) — stárt! . . . Stóp!*" The body is moved forward (backw.) by a rapid succession of quick contractions and relaxations of the muscles of the calves, the knees remaining straight and the body being carried well erect. The

movement is done from **wg.**, or **yd.** *c*, **toe st.**, or **toe ½ st.** (the other leg lifted backward or forward), and from **courtesy sitt.**

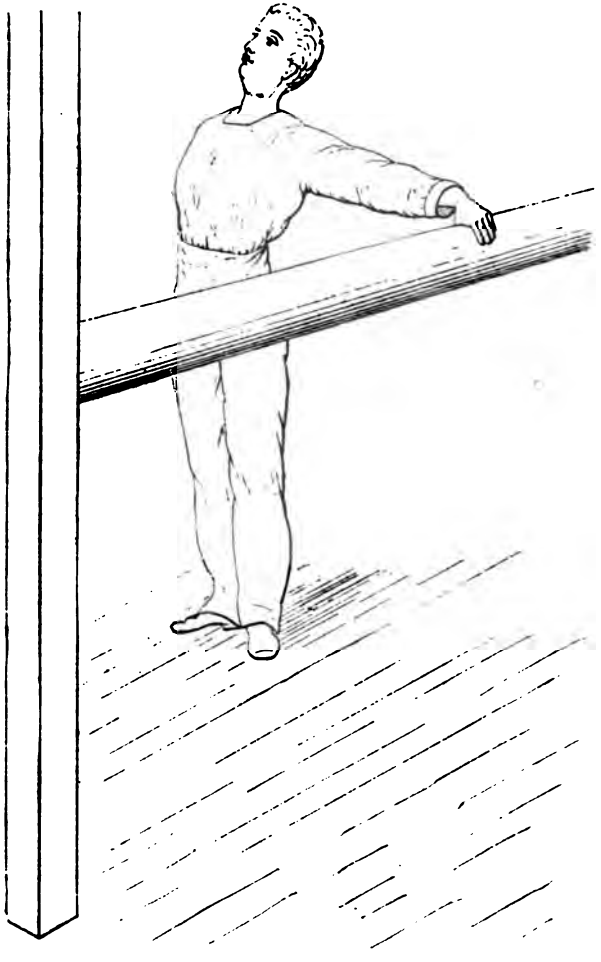


FIG. 210. — ½ YD. GR. ST. INTROD. TO VAULTING. COMMENCING AND FINAL POS.

pos., when it may also be done sideways. In Yd. *c* toe (½) st. hopping the hands may be allowed to hang loose and flop in

rhythm with the hopping, so that the whole is made to resemble the movement of a bird. Hopping has the same effects on circulation, respiration, and digestion as jumping, and hence may be used as such, especially for little folks. Considering its mechanics (except courtesy sitt. hopping), — a succession of double heel-elevations, — it should be called a balance-movement.

Rch. Gr. St. Introd. to Vaulting (Figs. 208 and 209). — The pupil stands at the horizontal bar, at whole distance from it. At the command, "*Grásp!*" he grasps the bar, thumbs behind, fingers in front (unless the bar be too thick to allow this), and arms straight. At the command, "*Sit up — one two!*" he jumps and pulls himself forward, so that he lands against the bar; and, resting over it, he holds himself there, his arms straight, his head high, chest well expanded, and the body and legs forming a graceful curve backward (balance hang. pos.). At the command, "*Three fóur!*" he swings himself off from the bar, his hands giving a strong push, and lands, in the usual manner, in the same place from which he started. At first the hands retain the grasp of the bar at landing. After the first day, the teacher omits the command, "*Grásp!*" and the pupil does not place his hands on the bar until just before he jumps.

½ Yd. Gr. St. Introd. to Vault. (Fig. 210.) — The pupil stands with his side turned to the bar, and grasps it with one hand (straight arm). At the command, "*Sit up — one two!*" he turns toward the bar,[1] grasps also with the other hand, and sits up as in the previous exercise. When jumping down, he pushes himself off by the forward hand, so that he lands in the same place and position (relative to the bar) which he had before sitting up. In these two exercises, the bar is at first placed at hip height, and gradually raised as the pupils gain

[1] The feet turn as in "left (r.) — fáce!"

proficiency. As many pupils as the bar will hold should do the movement at the same time.

If the bar is provided with saddles (or if there is a vaulting-horse or box), the following movement may be done: —

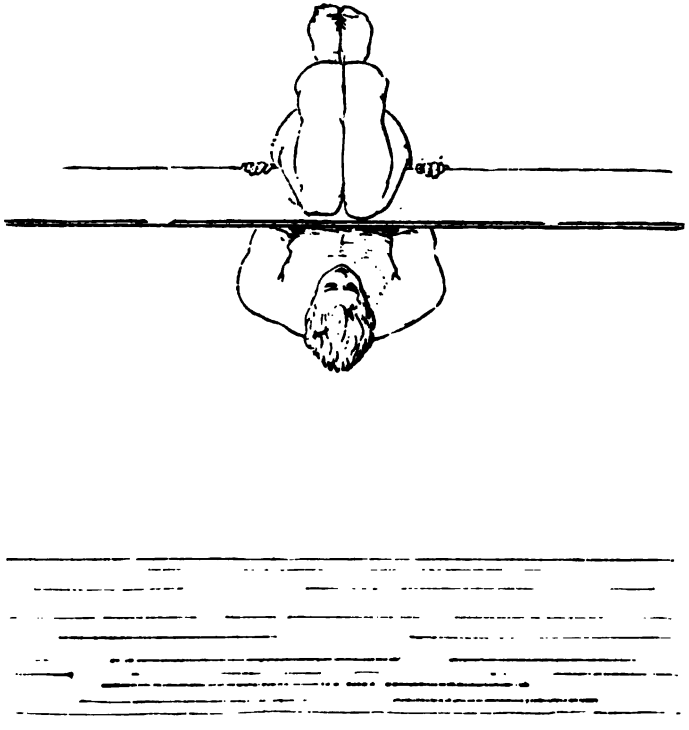


FIG. 211. — INTERMEDIATE POSITION OF SOMERSAULT OVER THE BAR.

½ Yd. Gr. St. Sit up Astride. — The pupil stands as in the previous exercise, and places his hand on one pommel of the saddle. At the command, "*Sit up — one two!*" he sits up as in the previous exercise, one hand on each pommel. "*Three!*" He swings the leg, which in commencing position was outside, over the pommel, and sits gently down in the saddle as if on horse-

back; his legs and arms hang straight down, and his trunk and head are erect. At the command, "*Sit off — four five!*" he grasps the pommel in front of him with both hands, swings his legs backward and over to the side from which he sat up; and, as he lands, he grasps the backward pommel with one hand, and faces the same way as he did when sitting in the saddle.

Introd. to Somersault over Bar (Fig. 211). — The pupil stands facing the bar, and sits up into balance hang. pos., at the command as above. "*Hands — turn!*" He turns his hands, one at a time, so that the thumbs come in front, the fingers behind. "*Introduction to somersault — one! Two!*" . . . 1. The pupil folds himself forward over the bar, so that he hangs, head down, and holds himself in this position by means of his hands and thighs; his legs are bent at the hips and knees. 2. He pulls himself back into balance hang. pos. When this has been practised for a day or two, the somersault may be tried.

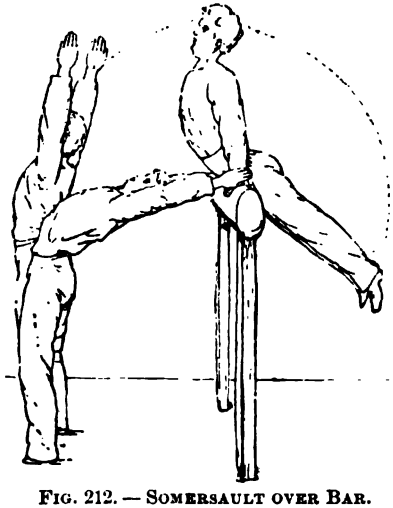


FIG. 212. — SOMERSAULT OVER BAR.

Somersault over Bar (Fig. 212). — Command, "*Sit up — one two! Hands — turn!*" (As above). "*Somersault — three four!*" The pupil folds over the bar, as in the previous exercise; and, turning his trunk fully under it, he lets his legs slowly swing over backward until they rest on the floor, so that he is in stride fall hang. pos. (Fig. 78). "*Five!*" He swings

his body forward from under the bar, and, pushing well off with his hands, he rises into str. stride st. pos. "*Six!*" He takes fundamental position. The corresponding arch-flexion serves as an introduction to this movement. The movement is made more difficult by placing the bar nearer the floor, until finally there is barely room for the trunk between the bar and the floor. When the bar is low, the hands are placed in turned position, and the sitting up omitted. Although this movement is usually described as vaulting (being a preparation for handsprings), it is better to apply it among arch-flexions, since it resembles these in effects.

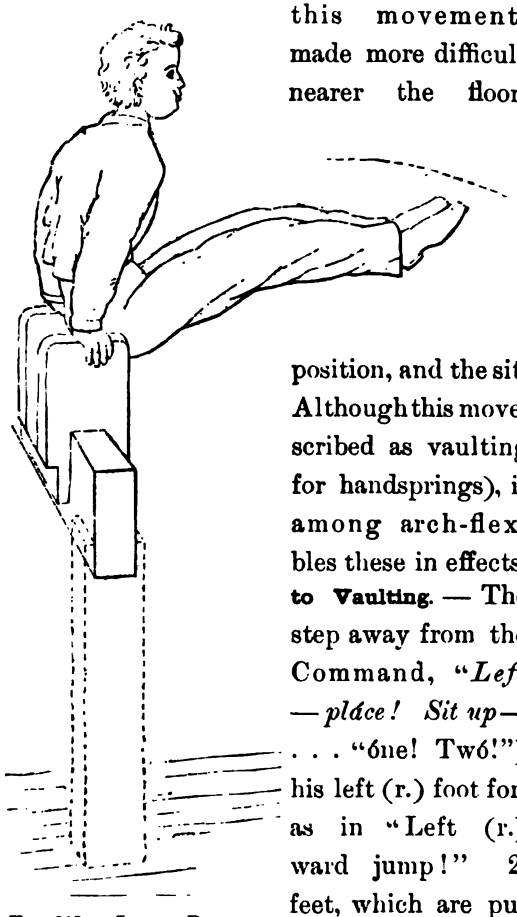


FIG. 213. — INSIDE POMMEL-VAULT ON BAR-SADDLE.

Wlk. *b* St. Introd. to Vaulting. — The pupil stands a full step away from the bar and facing it. Command, "*Left (r.) foot backward — pláce! Sit up — one two!*" (At first . . . "óne! Twó!") 1. The pupil places his left (r.) foot forward, and springs as in "Left (r.) foot forward, forward jump!" 2. He lands on both feet, which are put forcibly on the floor; and grasping the bar with both hands, he sits up as in the previous exercises. This mode of giving the start is called "double start," and is mostly used in vaulting when the start is taken by running.

"Sit off — three fóur!" is done as in previous exercises, except that the pupil throws himself still farther backward from the bar. Later on, this movement is practised with two and three steps' start, and finally with a short run.

Inside Pommel-Vault (Fig. 213). — The pupil stands facing the saddle (fixed on the bar). At the command, "*Spring!*" he sits up as in the previous exercise, one hand on each pommel,

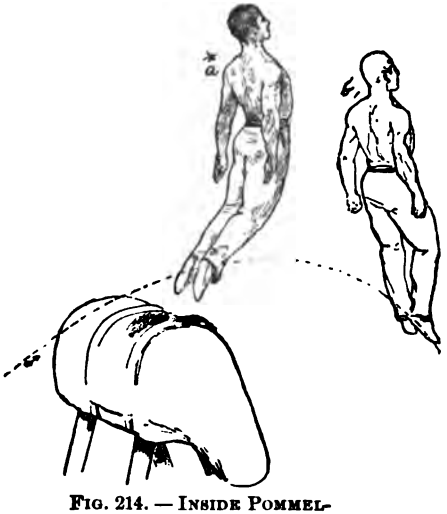


FIG. 214. — INSIDE POMMEL-VAULT ON HORSE ("*échapper*").

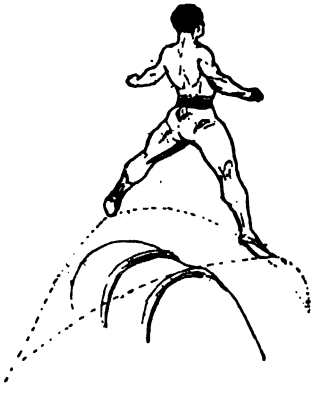


FIG. 215. — OUTSIDE POMMEL-VAULT ON HORSE ("*écarter*").

swings his legs quickly forward between the pommels; and, when they are well over on the other side, he relinquishes his grasp, and lands on the floor in ordinary manner. When practised for the first time, the movement is done so that, after sitting up, the pupil swings his legs slowly between the bars at the command of the teacher. Later the movement is done from running start, the legs being swung well forward, so that the body becomes arched from head to heels before landing. A sim-

ilar movement is done with the legs thrown outside the pommels (outside pommel-vault), when the hands must be removed earlier.

Advanced pupils may do these vaults without the saddles. The box or horse is then preferable to the bar, as affording greater safety, and the movements are done from running

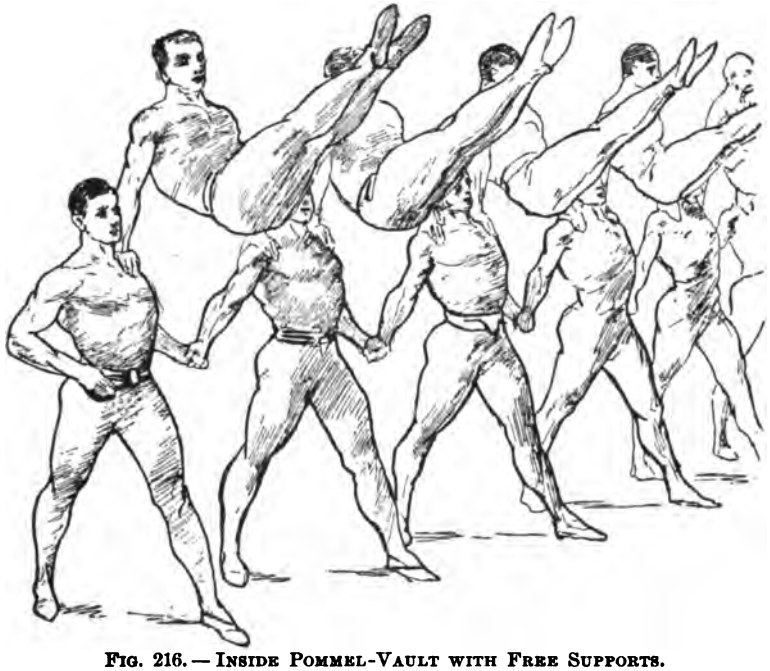


FIG. 216. — INSIDE POMMEL-VAULT WITH FREE SUPPORTS.

start. The hands stay on the apparatus only long enough to straighten up the trunk, and the body should be arched from head to heels when passing over (Figs. 214 and 215). In the outside vault, the legs may either be thrown out sideways as in Fig. 215, or swung back as in Fig. 214 — of course with the feet somewhat apart.

In absence of saddles, etc., the inside vault may be done in ranks with "chain support" (Fig. 216). For instance: ("*Open ranks, numbers two (one) one step backward — márch!*") "*Numbers one (two) chain support — stánd!*" The specified numbers place one foot forward, and extend their arms sideways until the hands touch. "*Numbers two (one) — spring!*" These numbers take one step forward, and, placing their hands on the shoulders of those in front of them, they vault between them

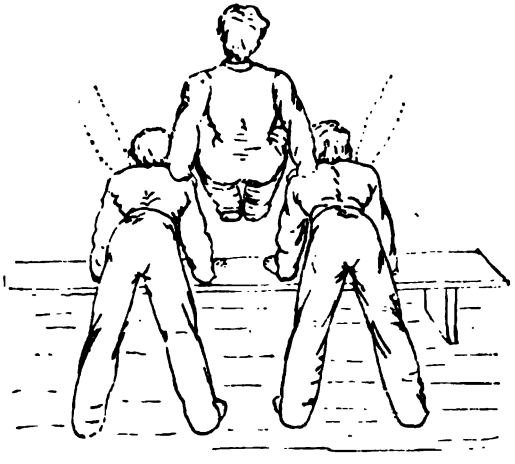


FIG. 217.
INSIDE POMMEL-VAULT WITH BENCH-SUPPORTS.

over the meeting hands, just as the movement is done through saddles. The supports must not lock hands, as some one might catch his feet, and fall, if the hands cannot quickly come apart. If benches are at hand, the movement may be arranged as shown in Fig. 217.

An exercise which forms an introduction to this form of vaulting is the stoop. fall. 2 F. placing forward (see abdominal exercises).

Face-Vault. (Fig. 218). — The bar is put at moderate height (so low that all can easily get over). The pupil grasps the bar with both hands, fingers in front, thumbs behind; and by jumping upward, giving a strong pull with his hands, and throwing

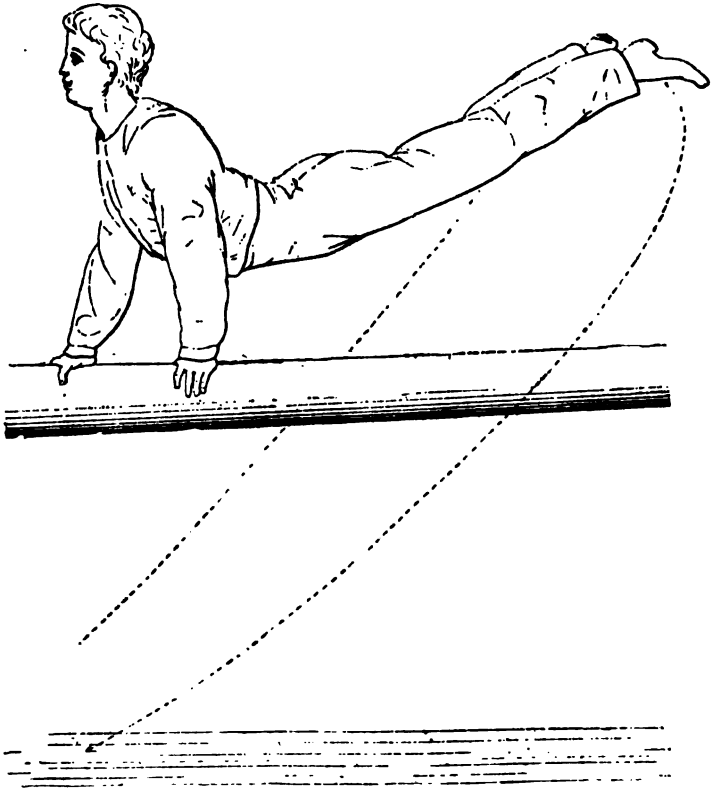


FIG. 218. — FACE-VAULT: SHOWING HOW THE HAND TURNS JUST BEFORE LANDING OCCURS.

his legs to one side, he swings himself over the bar, turning his face and whole front toward it. He lands (in usual manner) with one hand still holding the bar and that side turned to it (Fig. 220). When his legs are swung to the right, he should

land directly in front of the left arm, so that the latter is straight and at right angles to the bar, and *vice versa*. While the legs pass the bar, the head should be carried high, the arms should be straight, and the whole body form a graceful curve, the abdomen being lower than the feet and head. The hand which is to remain on the bar, in order to do so, has to be turned fingers behind, thumb in front, just before the landing occurs (as shown in Fig. 218).

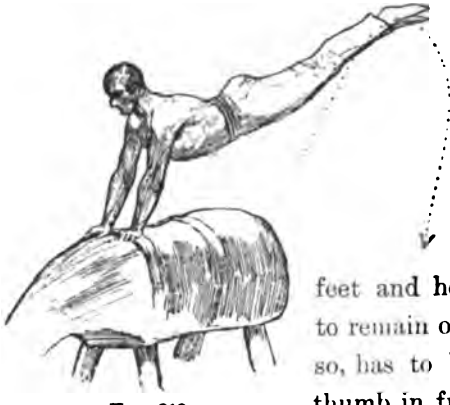


FIG. 219.
FACE-VAULT ON HORSE.

If the hand is already turned in this manner before the start, that arm cannot be so well used for pulling; the hand is apt to slip off the bar — which means accident — and the movement loses its beauty of form. The teacher (or another pupil) should stand on that side of the bar from which the pupil springs and be ready to help him if necessary. To do this, he stands close to the bar and takes hold of the pupil's wrist with one hand, and with the other grasps the same arm from behind and just below the shoulder; he will thus be best able to assist the pupil if need be. As the pupils gain skill, the

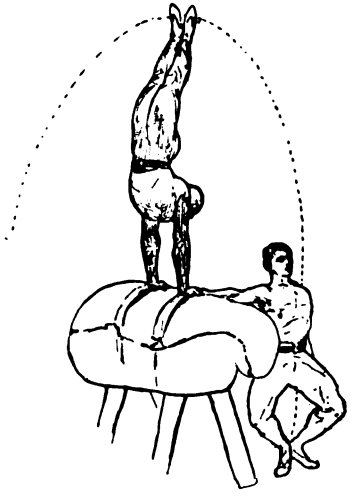


FIG. 220. — BALANCE-VAULT.

bar is raised from time to time. The movement is also practised with a short run for start on the same principles as the introd. to vault. ("double start"). It is then best done on the horse (Fig. 219) or box, these apparatuses being safer.

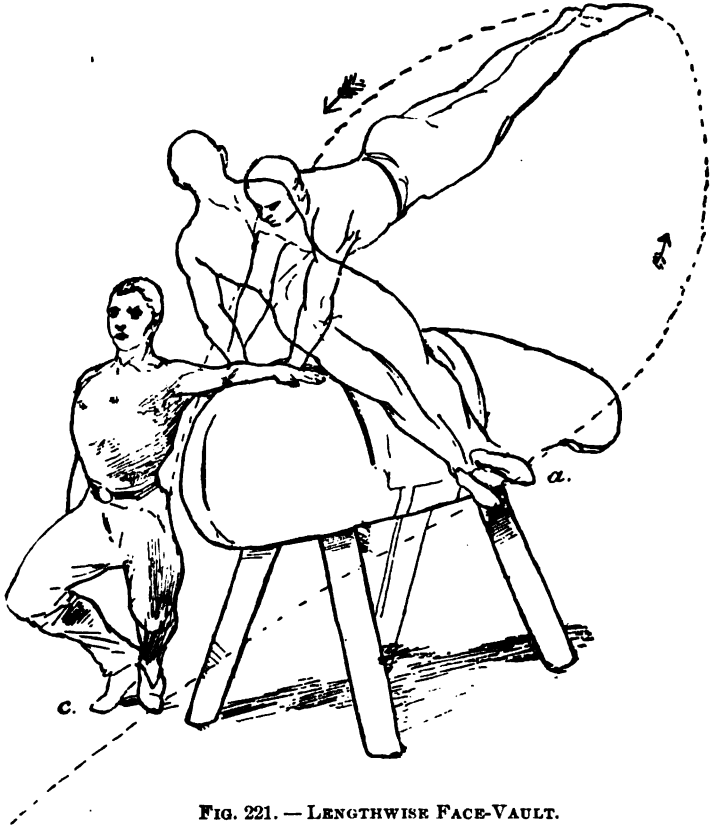


FIG. 221. — LENGTHWISE FACE-VAULT.

A modification of the face-vault is the "balance-vault" (Fig. 220), where the legs are swung into hand-stand and then to the side, so that the landing becomes the same as in face-vault. This is a good introduction to hand-spring.

Another modification is the lengthwise face-vault on box or

horse (Fig. 221), the start being given from the end of the horse, and the body turning to one side and around the hands, so that at landing the gymnast faces in a direction opposite that in which he started. This vault can also be done across the horse (Fig. 222), the landing occurring where the spring was taken. This, however, is an exceedingly difficult movement.

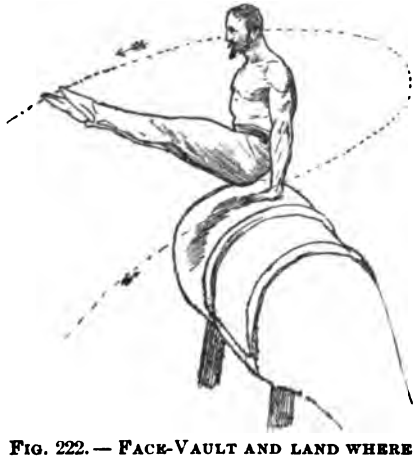


FIG. 222. — FACE-VAULT AND LAND WHERE START WAS TAKEN (ROTATE ON ONE HAND).

Face-Vault 180° (Fig. 223). — This is done like ordinary face-vault, except that the body is allowed to keep on turning until at landing it faces in a direction opposite that of the ordinary face-vault. While passing over, it is necessary to move the middle hand so as to have a hold with it at landing.

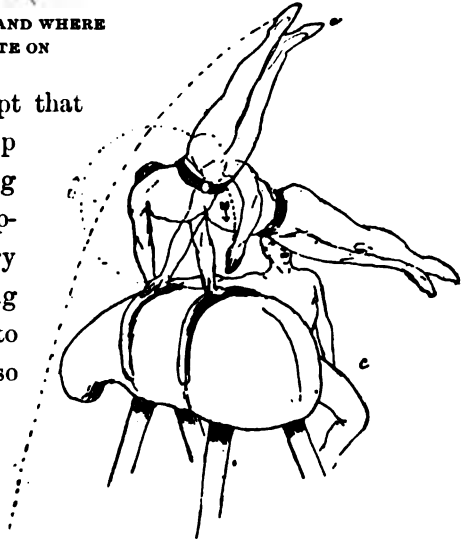


FIG. 223.
FACE-VAULT 180° TURNING.

Side-Vault, Face Forward, is a difficult movement done from running start, as shown in Fig. 224. The start is given as in face-vault; but the middle hand is immediately removed, and the body — which should be hori-

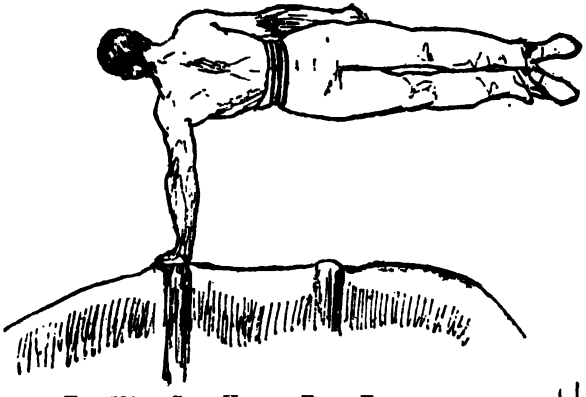


FIG. 224. — SIDE-VAULT, FACE FORWARD.

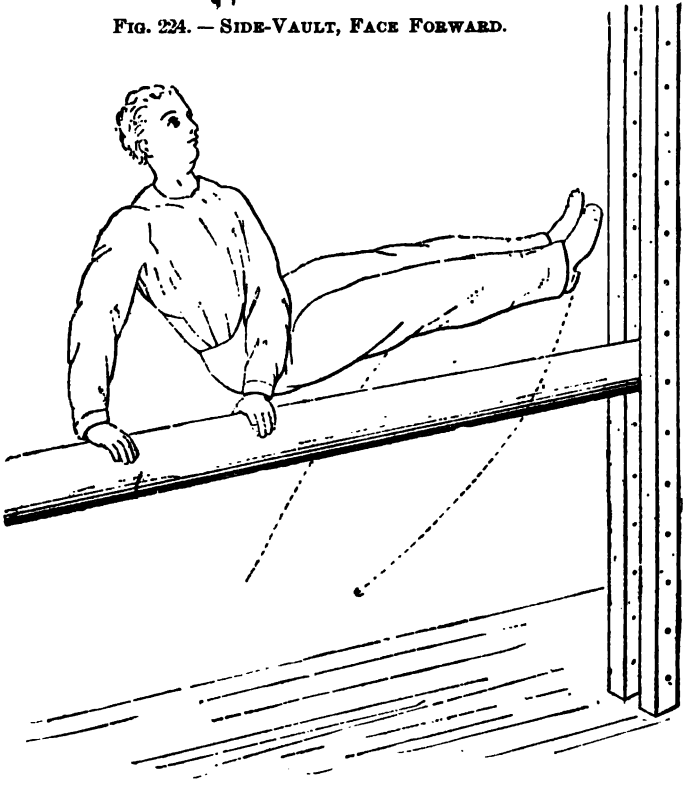


FIG. 225. — BACK-VAULT OVER BAR.

zontal and straight from head to heels — is balanced on the other ("distal") hand. Landing should occur facing straight forward, and care should be taken to drop vertically to the ground; for if the feet strike obliquely the knee of the upper leg may become sprained. It is probably more difficult to attain skill in this vault than in any of the preceding.

Back-Vault, or Sit Over (Fig. 225). — This is done on the same principles, except that as soon as the feet leave the ground the face is turned in their direction and the back toward the bar; the position of the body resembles sitting position. When the legs pass the bar, one hand (the left, if the legs are swung to the left, and *vice versa*) leaves it and is quickly swung behind the body, where it grasps the bar close by the other hand (which is now taken off), where it remains until the landing, knee-extension, and lowering of the heels have been done. Skilled gymnasts arch their body so that the hips are higher than the head and heels while passing over. This is an improvement upon the posture shown in Fig. 225.

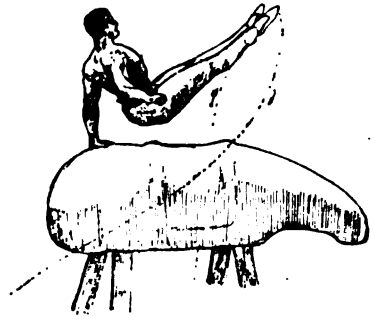


FIG. 226. — SIT OVER LENGTHWISE.

Sit Over Lengthwise (Fig. 226) is done so that the start is given from the end of the horse (box), and both legs swung around the hands from one side to landing on the other side of the horse, the hands changing grasp as described in the previous movement. Arching of the body gives a more perfect form than that shown in Fig. 226.

Back Vault with Half Start (Fig. 227). — The pupil stands

close to the bar with his side turned to it. He grasps the bar with one hand, swings the leg of the same side backward, then quickly forward, and, at the same time, he jumps with the other foot, and swings that leg forward too, thus throwing himself over the bar, both feet being brought together as they pass (like "sit over"). Before landing, he changes hands on the bar, so that the one which was outside supports him when he lands. The movement may be done so that, instead of on both feet, the pupil lands on the outside foot, and, swinging the other leg forward, he immediately jumps back to the other side of the bar, and continues in this manner from side to side, at the same time moving slightly forward until he reaches the end of the bar. It may also be done so as to face the bar while passing over and land facing opposite from the start. This movement may be called, "backvault with ½ start to face landing." For perfect form the free arm should be kept to the side and the body arched. Both these movements can be done lengthwise on horse or box, and the second one also crosswise, namely, "running face-vault from one hand and foot."

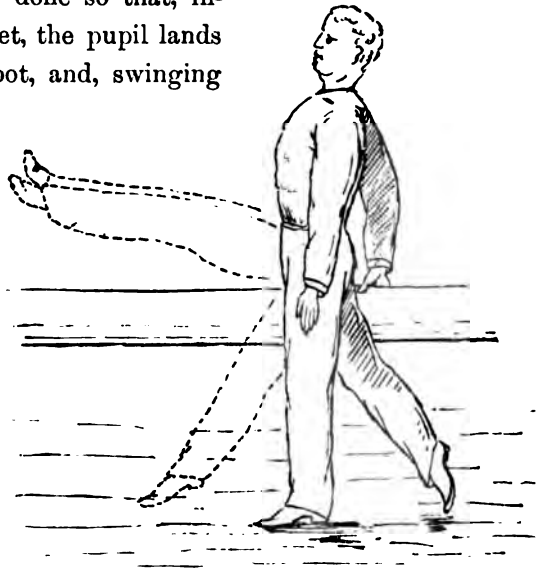


FIG. 227. — BACK-VAULT WITH ½ START.

Leap-Frog (Fig. 228) is too familiar to need description, it being sufficient to call attention to the posture of the support as shown in the cut. The one who jumps should spring from both feet, and should straighten up while passing over. It makes an excellent game to have several pupils forming a row of supports, and one leaping over each in succession. When he has passed the last one, he in turn forms support in front of the others. The one who is hindmost in the row starts leaping as soon as there is no one behind him. In this manner the whole row moves gradually from one end of the room to the other.

FIG. 228.
"LEAP-FROG."

Leap-Frog on Horse (Fig. 229).— This is executed like ordinary leap-frog, except that the impetus of springing must be greater. The hands should strike on the back end of the horse, and the body should immediately straighten up and become arched, with arms and legs well back and head high. The fact is, it is easier to clear great height and distance with good form than with drooping head and flexed hips and knees. Before attempting to leap all the way over, it may be well to practise "sit in the saddle" (Fig. 230), when sitting off is done either to the side (Fig. 219) or forward (Fig. 233 *b*).

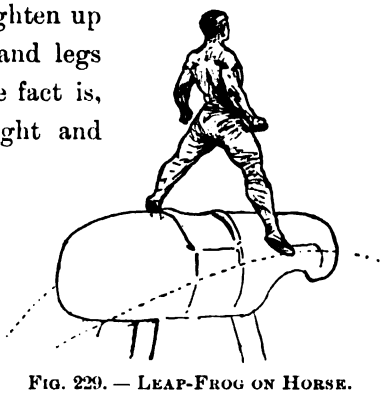


FIG. 229. — LEAP-FROG ON HORSE.

The leap-frog can also be done backw. (Fig. 231); and, whether forward or backward, with one or more men (or other obstacle) sitting in the saddle. The hands should then strike behind the men, not on them. Leap-frog over one man sitting straight (merely bending his head), and the horse full height, is about as handsome and dangerous a movement as there is in Swedish gymnastics — and Swedish gymnasts excel in it!

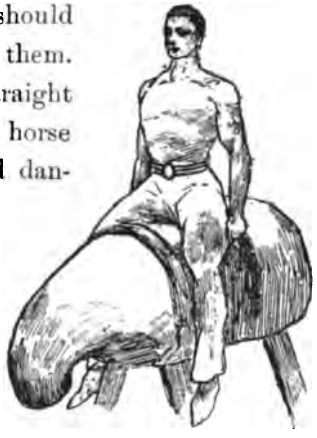


Fig. 230. — Sit in the Saddle.

Long Leap-frog (Fig. 233). — In this movement the hands strike on the front end instead of the back end of the horse (box). Any straightening up or arching is here out of the question, as there is time only for the effort of correct landing. This movement is in reality easier than the regulation leap-frog, unless the distance is very great. The movement shown in the cut is easier than it looks.

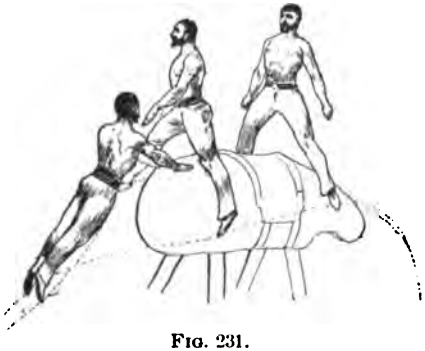


Fig. 231.
Leap-Frog Backward on Horse.

Tiger-jump [1] is the same as long leap-frog, except that it is done across the box (or horse), and the hands strike on the shoulders of another pupil, who stands on the other side of the box to catch the jumper. While the movement requires some courage for the first attempts, it is merely a show-movement after once learned.

[1] Pupils in the Posse Gymnasium have called this movement "Flying Angels."

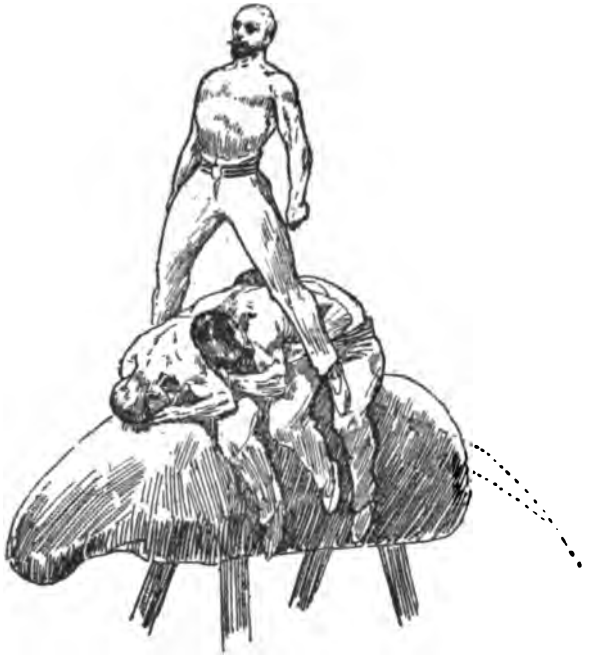


FIG. 232.— LEAP-FROG FORWARD ON HORSE, THREE "MAN UP;" (HANDS STRIKE ON THE HORSE, NOT THE MEN).

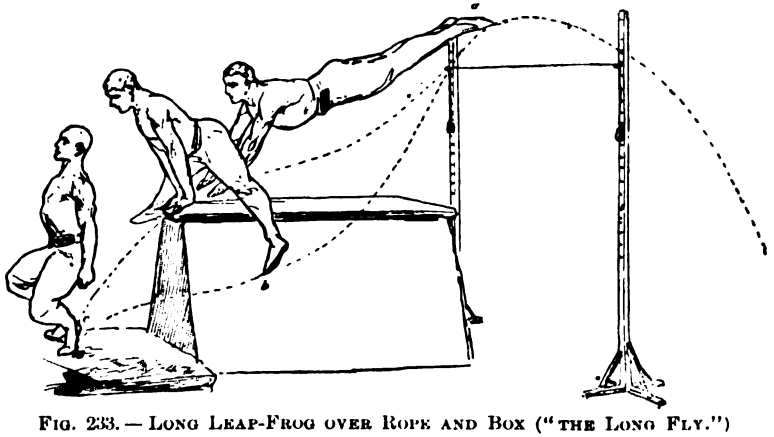


FIG. 233. — LONG LEAP-FROG OVER ROPE AND BOX ("THE LONG FLY.")

Stand in the Saddle (Fig. 234). — The pupil leaps into the saddle, leap-frog to stand in front of the hands, and then jumps off forward, throwing his arms into str. pos. By advanced pupils

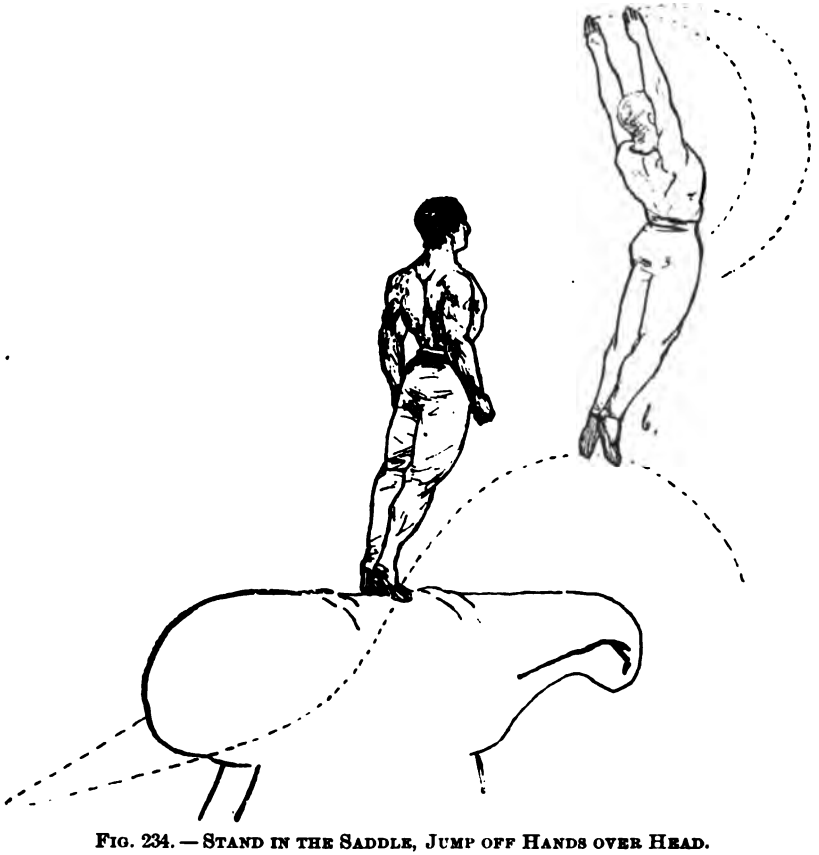


FIG. 234. — STAND IN THE SADDLE, JUMP OFF HANDS OVER HEAD.

the leap into the saddle may be taken by free-jump. It may also be taken as for inside pommel-vault (feet *between* the hands), which is a little more difficult than the form described above.

Stand-over (Fig. 235). — This is done like the preceding, except that the vaulter does not stop in the saddle, but keeps on together, so as to have them pass over the horse. In this vault it is best to have the front end of the horse a little lower than the back end. The movement can also be done between the hands. The stand-over might be called long outside (inside) pommel-vault. It can be done on the box, but the inclined horse is much safer.

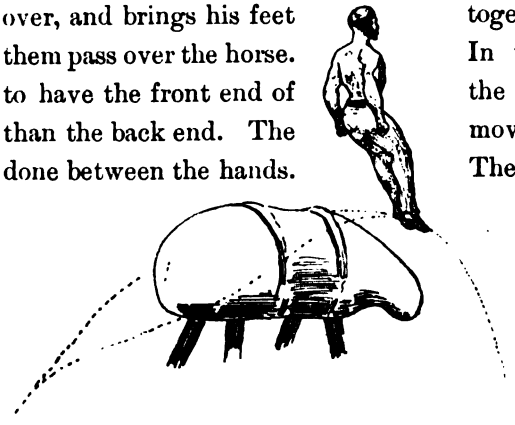


FIG. 235. — LEAP-FROG TO "STAND OVER," ON HORSE.

Leap-frog to Sit Over (Fig. 236) is done like leap-frog, except that one leg is swung over to the other side, so that landing occurs on that side instead of in front of the horse (box). If sufficient height is attained, the body can be arched as in leapfrog, while the leg passes over from one side of the horse to the other. (Fig. 236 shows the easier form.)

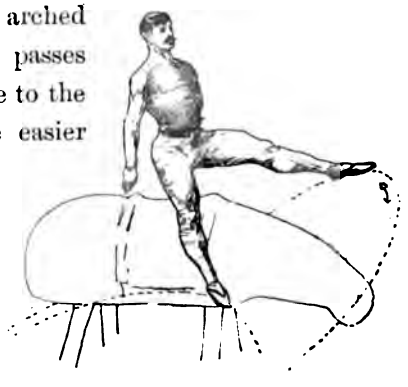


FIG. 236. — LEAP-FROG TO SIT OVER.

Vaulting through Double Bar, Face Up (Fig. 237). — The lower bar is put at usual height, the upper one about four feet higher. The pupil stands with his side turned to the bars and his hand resting on the lower one.[1]

[1] The arm should be straight (in reach pos.), and the hand well in front of the body.

Lifting himself on this hand, he now jumps, grasps the upper bar with his other hand, swings his legs forward between the bars, and lands on the other side with one hand on the lower bar. In this way, he jumps from side to side, using the land-

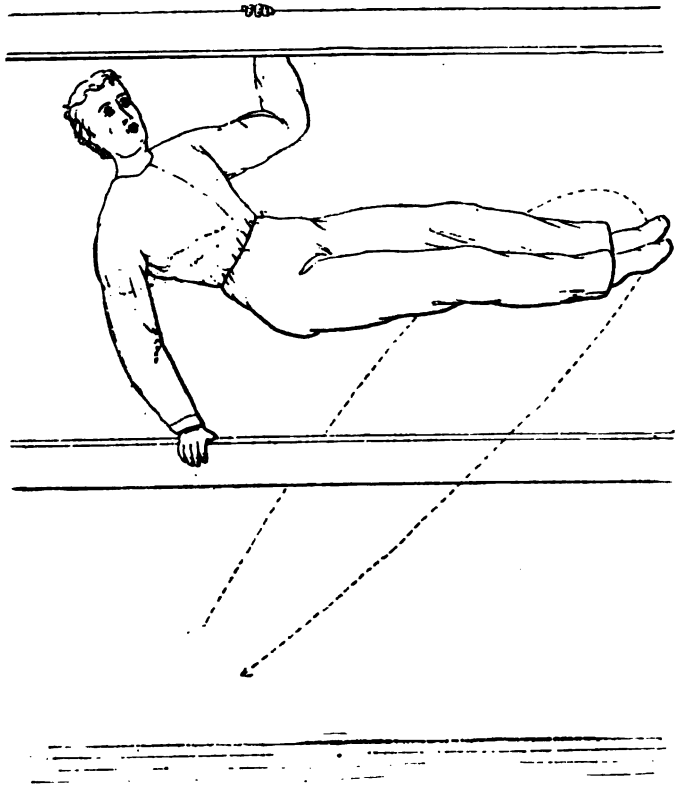


FIG. 237. — VAULTING THROUGH DOUBLE BAR, FACE UP.

ing for a new start until he reaches the other end. The body should be arched, and care should be taken to jump well forward, the upper hand striking a foot or more farther forward than the lower one. Beginners may use ½ start, with a run

from the side (spring from the outside foot). The head should be the last to pass through the bars.

Vaulting through Double Bar, Face Down (Fig. 238). — The

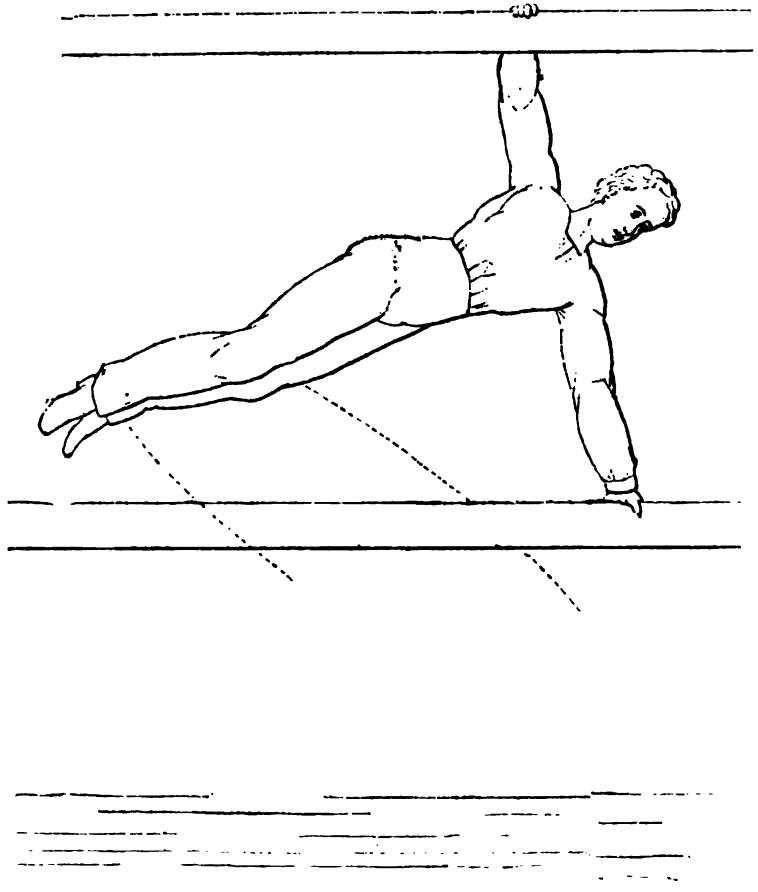


FIG. 238. — VAULTING THROUGH DOUBLE BAR, FACE DOWN.

start is taken with a short run, one hand is placed on each bar, and the vaulting is similar to that over the single bar. The pupil may also face straight forward throughout the movement, or he may "sit over," as previously described.

Cr. Hang. Vault over the Under Bar. — Standing one step away from and facing the double bar, the pupil jumps, grasps the upper bar with both hands (over gr.), swings his legs forward over the under bar, arches his body, lets go with the hands and

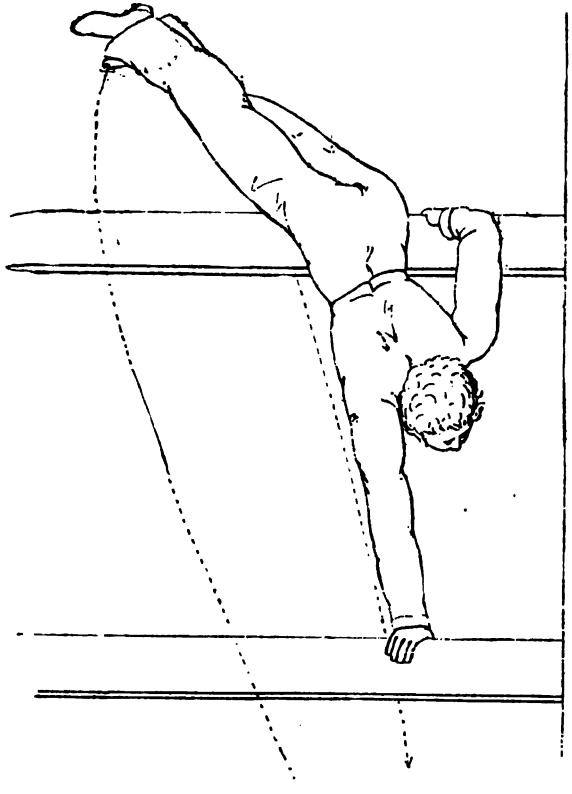


FIG. 239. — VAULTING OVER THE UPPER BAR.

lands in ordinary manner on the other side of the bars. The movement is also done from running start, especially when the bars are placed near together.

These otherwise easy movements are made more difficult by

putting the bars higher, or by placing them nearer together, either so that the under bar is raised or the upper one lowered.

Vault. over the Upper Bar (Fig. 239). — The start is taken by running. When the pupil jumps, he places one hand on the upper bar with the fingers forward, the other hand on the lower bar with thumb pointing forward, fingers backward. As soon as the hands have grasped, he throws his whole body to the side of the upper arm, and his legs swing over the upper bar, while he turns the front side of his body to that bar. Pulling with the upper hand, and pushing with the lower one, he tips himself backward over the upper bar, to which he subsequently removes the lower hand, so that he comes into balance hang. pos. (Fig. 209). He then sits off backward (as described in introd. to vault.), and places both hands on the lower bar when he lands. The bars must at first be put quite close together, the upper one so low that both legs can at once be swung over it (not one at a time as if climbing). The movement is exceedingly difficult.

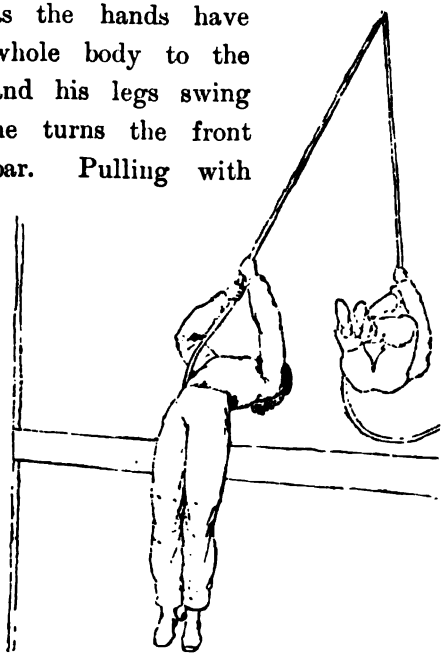


FIG. 240. — VAULTING WITH ROPE.

Vaulting with Rope (Fig. 240). — Like the movements on the double bar, this exercise is a heaving-movement combined with jumping. If a vertical rope is suspended at a convenient dis-

tance from the bar, the latter is used to jump over; otherwise the benches (or a horizontal rope) may be arranged as hurdle at a suitable distance (about three steps from where the rope hangs). Let us suppose that the pupil grasps the rope with the right hand. He takes one or two steps backward, stretches the hand that holds the rope as high up as possible, and turns this side towards the obstacle. Now he takes a rapid step forward with the right foot (Fig. 241), and springs from the ground. As soon as the feet leave the ground, the left hand grasps the rope above the right; and swinging his legs forward, he lets the rope carry him over the hurdle, while he hangs on bent arms. As soon as his legs pass the hurdle, he arches his body, drops the rope, and lands as in "forward jump." This movement, like all others, should be practised equally to each side. The higher the obstacle, the farther must it be distanced from the rope.[1] If the bar is very high, the start is taken by running, and the hands slide up on the rope when the feet leave the ground.

FIG. 241.
VAULTING WITH ROPE: THE START.

The vault may be done using *two* ropes for suspension instead of one; and the flying rings are then as suitable, the box, horse, or jumping-rope serving as hurdle.

Handspring (Fig. 242). — Although this movement is very violent, it may be safely tried by far advanced pupils. When practised for the first time, it is best done on the saddles (or

[1] Provided the point of suspension is sufficiently high above the ground.

low parallels), the bar being placed near the floor. The pupil places one hand on each pommel, swings his legs back and up,

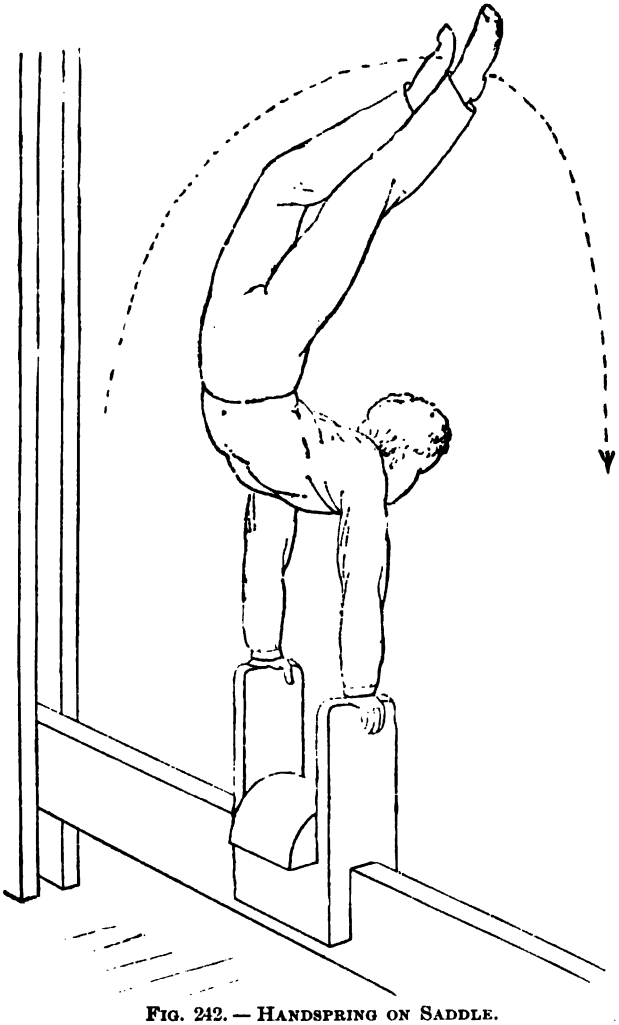


FIG. 242. — HANDSPRING ON SADDLE.

and, keeping his arms straight, he turns a somersault. Before landing, he pushes well off from the saddle with his hands, and

lets go his grasp of the pommels. A pupil should stand in front of each pommel, and give the necessary assistance by grasping the vaulter around the wrist and under the shoulder (compare Fig. 243). After some practice, no help is needed, although a pupil should always stand on the other side of the bar, so that accidents may not occur. The movement is also done with a run for start (spring from both feet).

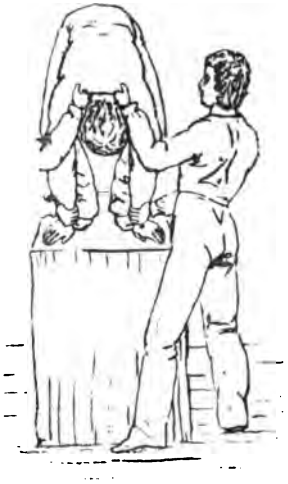


FIG. 243. — HANDSPRING FROM BOX WITH ASSISTANCE.

Later on, the handspring may be executed over the vaulting-box. As a preparatory exercise, the pupil stands on the box, and, placing the hands near the edge, turns a somersault, and lands on the floor, while two other pupils assist him (Fig. 243). As soon as this can be done with ease, the handspring is turned first across (Fig. 244), then lengthwise (Fig. 245), over the box, the start always taken with a short run. At first two pupils give assistance, and stand in a position which enables them to grasp the one who vaults (Fig. 246). Later on, they give no assistance,

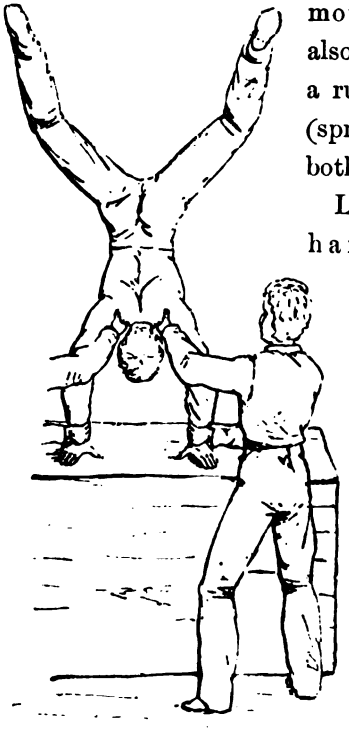


FIG. 244. — HANDSPRING ACROSS THE BOX WITH ASSISTANCE.

except at the landing, or when necessary to prevent accident. The handspring may be turned either with utmost speed, or so

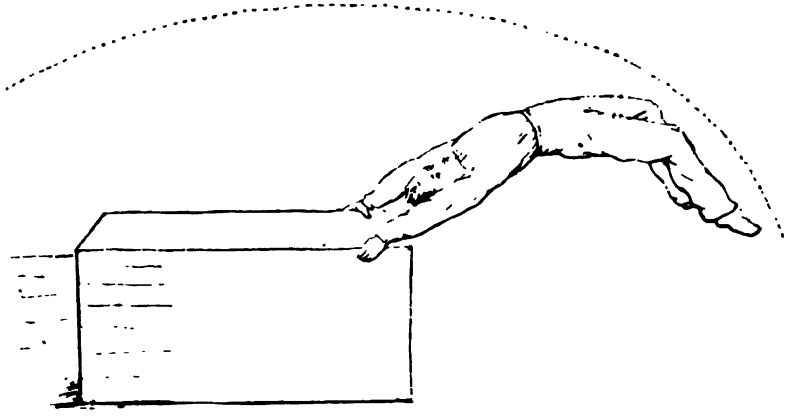


FIG. 245. — HANDSPRING LENGTHWISE OVER THE BOX.

that the pupil stands balancing on his hands for a moment, and then lets his legs gradually "weigh over."

Handsprings of a more difficult nature are shown in Figs. 247 and 248, the last one requiring not only courage and co-ordination, but also great strength in the extensors of the arms.

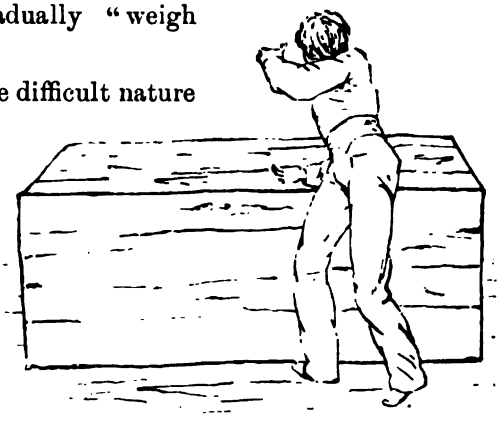


FIG. 246. — HOW TO STAND READY TO ASSIST ONE WHO IS TO TURN HANDSPRING OVER THE BOX.

The handsprings from running start (whether complete or to hand-stand) should not be done so that the legs are bent and gradually stretched, but so that the legs *swing* up from the

ground and remain straight from start to landing. The author, however, has seen only one man [1] who could do the movement in this perfect form.

Exercises preparatory to handsprings are deep arch-flexions, reverse stoop fall. pos., and various parallel bar exercises, etc.

There are many other forms of leaping, like pole-vaulting, various movements on the horse, on parallel-bars (different forms of "cut-off," etc.), on saddles, etc., which are evolutions or modifications of the preceding, and which may be used more or less for advanced classes. To describe them will, however, not be necessary nor possible in this small work.

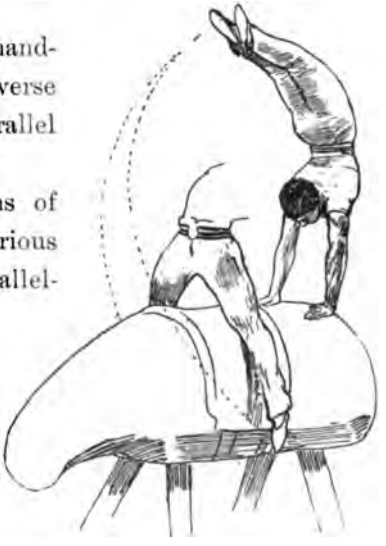


FIG. 247.
HANDSPRING TO SIT IN THE SADDLE.

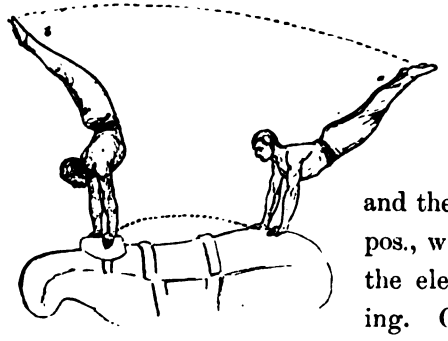


FIG. 248. — HANDSPRING, LENGTHWISE, WITH DOUBLE START OF THE HANDS.

Exercises on parallel-bars are very desirable preparations to vaulting, for they cultivate the automatic swinging of the legs and the strength of the bal. hang pos., which two things constitute the elements of nearly all vaulting. Good form in vaulting depends largely on the ability to arch the body suddenly, as soon as the feet leave the ground, so as to *swing* the body forward

[1] George Hultgren, of the Scandinavian Gymnastic Club of Boston.

instead of *lifting* it over the obstacle. "Dip-vaults" and similar movements over very high obstacles are to be considered as heaving-movements, not as vaulting.

A complete table of exercises should contain both jumping and vaulting; the jumping is usually made to come after the vaulting and immediately before the respiratory exercises. Advanced classes may have several exercises of each kind in every lesson. Yet it should be understood that no vaulting is to be tried until the main forms of jumping have been thoroughly practised; that no matter how far advanced the vaulting has become, the greatest attention should be paid to the landing; and that to cultivate the latter, free-standing jumping must be given frequently, even to "star-performers."

Synopsis of jumping (for progressive arrangement of jumping and vaulting, see Appendix): —

Prepare to jump,
once, twice, or more times { upw. / forw. / sidew. / backw. / 90° turn upw. / 180° turn upw. / 360° turn upw. / 2 A. fling upw. / 2 A. and L. fling upw. } jump at first to counts, later to the command, "*Start!*"

One, two, or three steps' start { forw. / backw. / sidew. forw. / 90° turn, forw. } jump.

wg. wlk. *a*, *b*, or *d*, toe st. change of feet
change from toe st. to stride toe st. } by jumping.

wg. stride toe st. upw. jump, feet striking together and landing in stride pos.

wg. / yd. *c* } toe st. L. elev. { sidew. / backw. } by jumping.

reach toe st. L. elev. forw. by jumping.

wg. / yd. } toe st. / toe ½ st. { hopping.

wg. courtesy sitt. hopping { forw. / sidew.

etc.

RESPIRATORY EXERCISES.

Synopsis: —

Respiratory Exercises:

- *Aim:* Produce normal respiration. / Remove venous congestion.
- *Contents:* Respiratory movements accompanied by gymnastic exercise.
- *Types:* St. / Turn st. / Fallout st. — 2 A. flg. / 2 A. elev.
- *Effects:*
  - Physical: Lessen blood-pressure. / Increase elasticity of air-cells. / Increase respiratory power.
  - Physiological: Better oxygenation of tissue. / Elimination of $CO_2 + HO_2$. / Lessen temperature. / (Lessen skin evaporation.) / (Lessen fatigue.) / (Lessen need of sleep.)
  - Psychological: Exhilaration. / Moral repose.
- *Progression:* Depends on progression of shoulder-blade movements.
- *Limitations:* Rhythm of movement to correspond to rhythm of respiration.
- *Relations:*
  1. Prepared by arch-flex. + heaving movts.
  2. Evolution from shoulder-blade movts.
  3. Applied: at end of lesson. / at beginning of lesson. / whenever needed.

Respiratory exercises consist of the respiratory movements accompanied by arm-movements, etc., to assist the respiratory act. They are applied in order to produce normal respiration; to increase the venous circulation; to increase the oxygen supply to the system; and to exercise the air-cells.

At inhalation a negative pressure is produced in the chest, so that the blood is drawn forward in the venæ cavæ, and in the pulmonary artery, the capillaries of the lungs expanding with

the expanding air-cells. The acceleration of the currents will be proportionate to the degree and (within certain limits) speed of the chest expansion. If then some means be used to increase the thoracic cavity beyond what ordinarily occurs at inhalation, — as, for instance, by raising the arms, rotating the trunk, or bending it backward, etc., — and if that expansion is made to take place with some degree of speed, it is evident that the greatest effect will be produced upon the venous circulation. Also, the extension of the muscles occurring during the exercises described below causes a distension of numerous small veins, increasing the vascular capacity, and hastening the venous currents regardless of the thoracic aspiration ; so that the sum total of both (chest-expansion and muscular extension) will be a high degree of diminished blood pressure on account of the increased *vis-à-fronte*. At exhalation the blood is driven into the left heart and into the aorta with a force proportionate to the duration and speed of the relaxation of the thorax; at the same time the venous pressure increases, especially on the semilunar valves of the pulmonary artery. If the relaxation of the thorax occurs suddenly, or if it is changed into a forcible contraction, the penetrating energy of the arterial currents will increase manifold, and the left ventricle will suffer a sudden and violent dilatation, which effect will be all the stronger if the preceding inhalation has been very complete (the capillaries of the air-cells being well filled), and if the arms assist in depressing the chest — as occurs in respiratory exercises. For that reason it is essential that, in these, the exhalation should be slow and steady, so as to produce a minimum of penetrating energy, while, on the other hand, the inhalation may be given a little more speed than usual. In any case the arm-movement employed should follow the rhythm of normal respiration (inhalation — exhalation —

pause — inhalation — exhalation — pause, etc.) and the respiratory act must not be made to follow any arbitrary or artificial rhythm, like that of music, etc.; nor is it desirable that all the members of a class should do the movement in absolute unison, for no two persons normally breathe exactly alike.

As the air-cells are brought more fully into play, their power of expansion and recoil grows; their tonicity increases, and their tendency to disease lessens. In that manner, by exercising the air-cells, — giving them an opportunity for normal action, — the respiratory exercises will tend to produce strong and healthy lungs. They also cultivate the respiratory power, since they bring the respiratory muscles into active contraction. Yet they are used but little for that purpose, since so much more can be accomplished in that direction by arch-flexions and heaving-movements. The fact is, these two classes of exercise prepare the way for respiratory exercises, inasmuch as they cultivate the possibility of normal respiration.

As respiration grows deeper, the tidal volume of air increases, and more blood passes through the pulmonary vessels in the same given time. As a result a greater amount of oxygen will be taken into the blood; more energy will be supplied to the body; the metamorphosis of tissue will be increased, and the tide of life will rise; the degree of usefulness of the individual will grow, for more energy has been given him to work with. Also at exhalation the increased tidal volume carries with it a greater amount of carbon dioxide and water, so that some of the most essential elements of excretion are being eliminated with greater rapidity; waste matter is being removed in greater quantities. The accumulation of carbon dioxide is one of the chief causes of fatigue, and if this is removed at a more rapid rate, it is evident that the period of work can be lengthened

proportionately; and it will be found (*a*) that a judicious use of respiratory exercises throughout a lesson in gymnastics will make the effect of a properly applied lesson one of rest instead of fatigue; (*b*) that a person who has practised respiratory exercise so as to make his tidal volume normally large can shorten the hours of sleep, since part of the purpose of sleep, the storing up of oxygen, has been substituted, and the other part, the resting of attention, requires but little time, and is even better with shortened sleep, since there is then less opportunity for loss of co-ordination recently acquired in the wakeful state.

The increased elimination of water through the lungs will lessen the bodily temperature, and will also diminish the skin-evaporation, since lungs and skin are complementary organs. In that manner properly arranged gymnastics will not necessitate a bath after the lesson, at least not after school-room exercise. It should be understood, however, that when the lesson contains many and violent exercises, as in gymnastics for advanced classes, a cold sponge bath becomes a necessity in order to prevent taking cold from the rapid loss of heat through the skin-evaporation. The bath, however, does not heighten the effect of the exercises unless it precedes these.

By hastening the general circulation, the respiratory exercises produce a degree of exhilaration akin to the sense of total well-being — a consciousness of an abundance of general energy, of power, and of will to do not only great deeds, but good deeds as well. They create in the individual a sense of moral repose or consciousness of *goodness as a duty* — probably generated by the heightened normal functional activity — which is neither as definite nor as well emphasized by any other physical cause. So that to breathe well will mean to live well, to live longer, and to live better.

Respiratory exercises are always applied at the end of a lesson, to "prepare for rest," and to lessen the (venous) blood pressure heightened by the preceding exercises, especially by jumping and vaulting; they are always applied after running, to lessen the pressure in the lungs, and to further a rapid elimination of the carbon dioxide accumulated by the repeated contraction of the large muscles of the legs. They are also applied at the very beginning of lessons embracing many or strong exercises, so that a greater allowance of oxygen may be taken into the system, to be stored up in the tissues and become ready for use at the end of the lesson, to make up for that expended. For it is to be remembered that while exercise increases respiration, oxygen must undergo various processes before it can be turned into muscular contraction, so that that inhaled cannot be used until sufficient time has elapsed for its assimilation. In that manner the respiratory exercises at the end of a lesson will not be sufficient to prevent or to immediately remove fatigue.

The respiratory exercises are all arm-movements, and as such are prepared by the corresponding shoulder-blade-movements; so that until its mechanics have become well acquired, — i.e., its co-ordination has become habitual, — the arm-movement is not used for respiratory purposes. For, any movement requiring and done with full volition stimulates heart-beat and respiration, so that the use of a non-acquired arm-movement as respiratory exercise would cause a loss in the effects desired.

Before going into the details of special movements, it may be well to warn against erroneous forms of respiratory exercises.

A time-honored method, recommended even in medical journals of quite recent date, was that of breathing in as much as one could hold, and "then go through the usual calisthenic exercises while holding one's breath." Holding the breath for any

length of time will tend to diminish the power of recoil in the air-cells by retaining them in expansion, and may lead to emphysema (= the chest remains expanded and the power of exhalation has diminished); it will cause a retardation of the venous currents; the blood-pressure will rise even to regurgitation; and if now the arterial pressure is increased at the same time by active movements ("the usual calisthenic exercises"), the venous congestion will be all the more severe. Similar effects are produced by loud singing during exercise: here the gymnast does not merely hold his breath, but he makes sudden efforts of exhalation (see above), and meanwhile keeps increasing the resistance to the arterial current!

Another old-time method was that of beating one's own chest during deep respiration, or while a large amount of air was confined in the lungs. Although percussion applied by another person (yet never when the patient *holds* his breath) is most beneficial (the vibration thus caused increasing the contractility of the air-cells), it is at best of no value when applied by one's self; for, to give the blows, one has to fix the muscles which hold the arms to the trunk: and when these muscles are rigid, while the arms are raised forward, they compress the chest (which interferes with free respiration), and make its walls too rigid to vibrate. As for applying percussion, while holding one's breath after deep inhalation, that is the very best means of distending the air-cells, — the same as one would distend an air-filled rubber ball by squeezing it.

Again, some teachers tell their pupils to breathe with their abdomens, intercostals, lumbar muscles, etc. Aside from the fact that the abdomen is not a respiratory organ, the effort of voluntarily making the abdomen swell at inhalation usually leads to holding the breath and driving the lungs down on to

the diaphragm by contracting the chest from above downward; venous congestion will set in, and will in this case be particularly localized into the pelvis. By frequent repetition pelvic hyperæmia, with its far-reaching *sequelæ*, will result; it may take years to undo the ill effects, and nothing good has been gained to make up for the injury.

To learn to energize the intercostals, lumbar muscles, etc., for respiration may be excellent practice for the concentration of attention into any given motor pathway; but as a respiratory exercise it is a pitiable example of waste of time and energy. It is far simpler to tell the pupil to inhale and exhale, and meanwhile make him do a certain prescribed exercise that will localize respiration chiefly to the desired portion of the lungs. For by changing the arm-movement or the position of the trunk it is possible to produce a greater expansion in a given portion of the chest than in others, and the lungs will expand the most where the chest expands the most, i.e., where the inrushing air will meet with the least resistance. By doing the necessary movement, without having to fix attention upon anything but the arm-movement and the respiratory act, one can breathe chiefly with the apex of the lungs, the base, the anterior one-half, with one lung more than with the other, etc., and meanwhile one does not even need to know that there are such things as lungs, diaphragm, abdomen, etc. It is on this plan that the respiratory exercises of Swedish gymnastics have been arranged; and certainly in gymnastics for children any other would be useless; and the same holds good for a majority of adults.

The progression of respiratory exercises depends upon the classes from which they are borrowed. It need not be strict, since these movements are not applied for physical *development;*

but that exercise is chosen whose effect is desired at the time.

When an exercise is to be respiratory, the words "*with respiration,*" or "*breathe in, breathe out,*" should always precede the command for the arm-movement; and, this being understood, they will not be repeated in the following descriptions.

St. 2 A. Elev. Sidew. — Command, "*Arms sideways — lift!*" The arms are lifted straight sideways into yard *c* pos. (Fig. 82). "*Sink!*" The arms are lowered into fundamental position. After the movement is understood by all, it is better to command. "*Arm-elevation sideways — one! Two!*" . . . Inhale while the arms rise, exhale while they are lowered. The movement raises the whole chest, thus expanding it vertically. It emphasizes respiration with the base of the lungs (diaphragm).

St. 2 A. Elev. Sidew., w. 2 Heel-elev. — Command "*Arm-elevation sideways, with heel-elevation — one! Two!*" or "*Arms and heels lift and breathe in — one! Sink and breathe out — two!*" . . . 1. The arms are lifted and the heels rise at the last moment. 2. Arms and heels are again lowered. It may also be done with 2 Kn. flex.: —

St. 2. A. Elev. Sidew. w. 2 Kn. Flex. — Command, "*Arm-elevation sideways, knee-flexion — one! Two!*" . . . 1 = Yd. *c* courtesy st. pos., the heels rising as the knees bend. 2 = Fund. pos., the heels being lowered as the knees stretch.

St. 2 A. Elev. Sidew. w. ½ Step Forw. — Command, "*Arm-elevation, sideways, half-step forward — one! . . . Four!*" 1 = Yd. *c* walk. *b* st. with the left foot, the weight of the body fully on the advanced foot, the backward heel raised. 3 = 1 with the right foot. 2 and 4 = Fund. pos.

2 A. elev. sidew. is also done from turn close st. (st., stride st.), fallout *b*, *d*, and turn fallout *a* pos.

Yard *d* **St. 2 A. Elev.** — Command, "*Arms sideways — lift! Hands — turn!* (Fig. 141.) *Arm-elevation — one! Two!*" (or "*Arms lift and breathe in — one! Sink and breathe out — two!*") . . . . 1. The arms are raised into str. pos. 2. They resume yd. *d* pos. Inhale while the arms rise, exhale while they are lowered. The movement expands the lateral parts of the chest, while it slightly contracts the anterior superior (clavicular) region. The greatest expansion is at the middle lateral portion of the lungs. The movement is always done with even rhythm, and is usually followed by yd *a* 2 A. flg.

On the same principles are executed: —

Yard *d* { **Fallout** *b*, *d*. / **Turn** { **close st.** / **stride st.** / **fallout** *a*. } } **2 A. elev.**

In the fallout positions, the trunk should be *erect;* hence, command, "Left (r.) foot, large step, backward — pláce!" etc.

Yd. *d* **St. 2 A. Elev. w. 2 Heel-elev.** is done on the same principles as 2 A. elev. sidew. w. 2 heel-elev., the heels rising at the last moment and being lowered gradually.

Yd. *d* **St. 2 A. Elev. w. 2 Kn. Flex.** is executed so that the heels rise while the knees bend, and *vice versa* (compare above).

Yd. *d* **Toe St. 2 A. Elev. w. 2 Kn. Flex.** — Command for commencing position, "*Arms sideways — lift! Hands — túrn! Heels — lift!*" and for the movement, "*Arm-elevation with knee-flexion — one! Two!*" . . . 1. The arms rise into str. pos., while the knees bend to right angles (inhalation). 2. Commencing (yd. *d* toe st.) position is resumed (exhalation). This movement should first be practised as a balance-movement.

Yd. *d* **Courtesy Sitt. 2 A. Elev.** will need no description.

St. 2 A. Elev. Sidew. Upw. — Command, "*Arm-elevation sideways upward — one! Two!*" . . . 1. The arms are raised through yard *d* pos. into str. pos. 2. They are lowered sideways downward, and carried as far backward as possible. The turning of the hands is done gradually, both when the arms are raised, and when they are lowered.[1]

St. 2 A. Elev. Sidew. Upw. w. 2 Heel-elev. — The heel-elevation occurs quickly, just before the arms reach str. pos., and the lowering of the heels takes place slowly and gradually. Command, etc., on the same principles as previous movements. It may also be done from the positions enumerated under 2 A elev. sidew.

St. 2 A. Elev. Sidew. Upw. w. 2 Kn. Flex. — Command, "*Arm-elevation sideways upward with knee-flexion — one! Two!*" 1. The arms are raised into yd. pos., while the heels are lifted, and continue rising into str. pos., while the knees bend to right angles. 3. The arms are lowered into yd. pos., while the knees are straightened, and continue into fund. pos., while the heels are lowered. Inhalation is done while the arms rise ("*One!*"), exhalation while they sink ("*Two!*"). At first the movement may be done in four counts: 1 and 3 = yd. *d* toe st. 2 = Str. courtesy st. 4 = Fund. pos. This, however, is merely a transitory introduction to the true movement just described.

St. 2 A. Elev. Forw. Upw. (Fig. 249). — Command, "*Arms forward upward — lift!*" The arms are lifted straight forward upward through reach pos. into str. pos. "*Sideways downward — sink!*" The arms are lowered through yd. pos. into fund. pos., the hands turning gradually. When the arms are raised forward upward, the chest becomes vaulted forward and raised vertically, it becomes no wider, but its capacity grows larger in

[1] For argument, see Appendix.

a longitudinal direction. The following movements are done on the same principles: —

Fallout *b, d.*
Turn fallout *a.* } **2 A. elev. forw. upw.**

The arm-movement may also be combined with heel-elevation: —

St. 2 A. Elev. Forw. Upw. w. 2 Heel-elev., the heels being raised just before the arms get into str. pos., and lowered gradually. Command and execution are, in other respects, similar to the movement just described. The arm movement may also be combined with a trunk-rotation: —

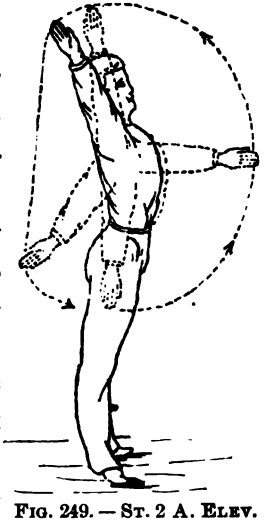


FIG. 249. — ST. 2 A. ELEV. FORW. UPW.

St. 2 A. Elev. Forw. Upw. w. T. Rot. — Command, "*Arm-elevation forward upward, trunk-rotation left* (*r.*) *and right* (*l.*) — *one! . . . Four!*" 1. While the trunk is rotated to the left (r.), the arms are raised (inhalation). 2. While the trunk is rotated forward, the arms are lowered (exhalation). 3. As No. 1 to the opposite side. 4. As No. 2. The movement may be done from **st.**, **close st.**, or **stride st. pos.** In rotated position, the chest is more expanded than when facing forward; hence this movement is stronger than the corresponding one without rotation. Before trunk and arm movement are combined, the 2 A. elev. should be executed alone from turn st. (close st., stride st.) pos.

St. 2 A. Ext. Sidew. — The usual 2 A. ext. (also upw.) may be made into a respiratory exercise, if inhalation is done when the arms extend, exhalation when they bend, the arm-movement

following the rhythm of deep respiration. But to get the most chest-expansion out of this movement, the palms of the hands should be turned up as in yd. *d* pos. (Fig. 134); for in this position the tendon of the *m. pectoralis major* is pulled backward and partly wound around the *humerus:* the tension thus caused in the muscle elevates the sternum and pulls the upper ribs apart, thus expanding the chest still more. Hence a better respiratory exercise is the

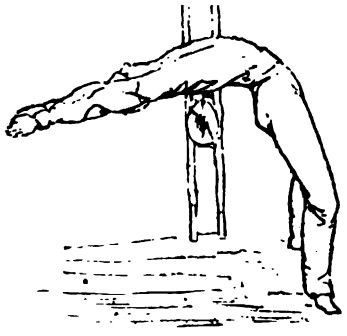


FIG. 250. — STR. ARCH SUP. STRIDE ST. 2 A. EXT. UPW.

St. 2 A. Ext. to Yd. *d* Pos. (Fig. 134). — Command, "*Palms up, arm-extension sideways — one! Two!*" . . . The movement is done slowly; and the flexion is not as rigid nor as complete as in the rapid 2 A. ext., the elbows not being brought close to the waist. (*May* also be done with 2 Heel-elev.)

Str. Arch Sup. Stride St. 2 A. Ext. Upw. (Fig. 250). — The bar is placed below hip-height, and (to the teacher's command) the pupil takes str. stride st. pos., and bends backward to horizontal position over the bar, so that it rests across the middle of his back, supporting him there. When the bar is low the pupil has to bend his knees. "*Arm-extension upward slowly — one! Two!*" . . . The arms bend only to yard *e* pos. (Fig. 137). Inhalation is done when the arms

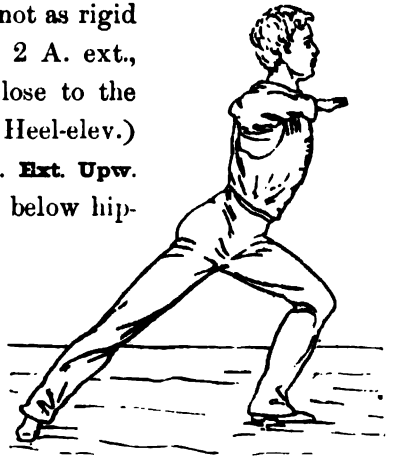


FIG. 251. — YARD *a* TURN FALLOUT *a* POS.

extend upward. In the backward flexion, the chest becomes forcibly vaulted, and the effect of the arm-extension is thus increased. The position would accelerate the heart-beat if the trunk were not supported by the bar. The movement should first have been practised as an arch-flexion.

Yd. *a* St. 2 A. Fling. (Fig. 135). — Command, "*Arms forward bend and sideways fling — one! Two!*" . . . Inhalation takes place while the arms are swung sideways, exhalation while they are being bent. The sideways flinging is much less rapid than in shoulder-blade-movements of the same mechanics. This movement expands the clavicular region of the chest (broadens it), a portion usually abnormally flat in persons not possessing physical culture. The chest expanding the most over the apices of the lungs, these will be brought emphatically into play. The movement is used a great deal and for a long time for beginners, since it develops just that part of the chest where they are the most hollow, and exercises that portion of the lungs which is the most inactive. On the same principles, the following are done: —

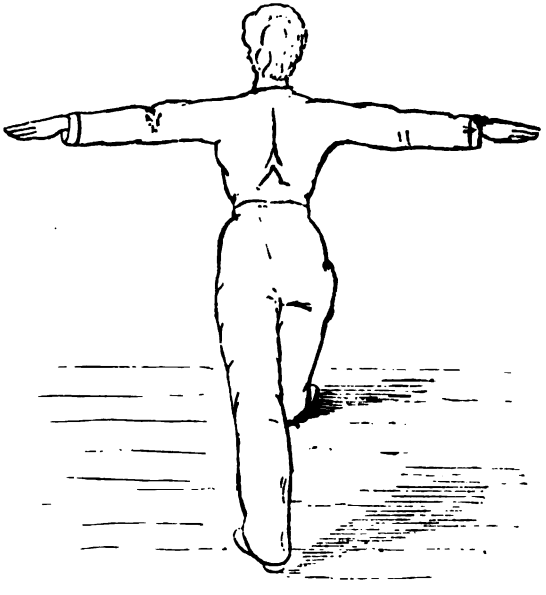


FIG. 252. — YARD *c* FALLOUT *b* POS.

Yard *a*. { **Turn (close stride) st.** / **Fallout** *b*, *c*, *d* (Fig. 252) / **Turn fallout** *a* (Fig. 251) } **2 A. fling.**

Yd. *a* **St. 2 A. Flg. and F. Pl. Forw.** — Command, "*Arms forward — bend! Arm-flinging sideways, foot-placing forward — one! . . . Four!*" 1 and 3 = Yd. *c* wlk. *b* st. pos., each foot alternating (beginning with the left).

Yd. *a* **St. 2 A. Flg. ½ Step Forw.** — Command, "*Arms forward — bend! Arm-flinging sideways, half-step forward — one! . . . Four!*" 1 and 3 = Yd. *c* wlk. *b* st. pos., with the weight fully on the advanced foot, the backward heel being raised, and the body well arched (compare Fig. 41). This movement may also be done with T. rot. and ½ step sideways forw.: **Yd.** *a* **st. 2 A. flg., T rot. and ½ step** *a*, command, "*Arms forward — bend! Arm-flinging sideways, trunk-rotation and half-step sideways forward — one! . . . Four!*" Suitable for very advanced classes.

FIG. 253.
YARD *a* ARCH ST. POS.

Yd. *a* **Walking 2 A. Fling.** — Command, "*With arm forward flexion and sideways flinging, forward march — one! Two! Three!*" . . . 1. Left foot moves a step forward, while the arms are placed in yard *a* pos. 2. The arms remain in this position while the right foot takes a step forward. 3. The left foot moves forward while the arms extend, and so on as far as the size of the room will allow. The marching is necessarily slow, but yet determined and in good posture. The effect of the arm-flinging, of restoring free respiration, is thus combined with that of slow marching: — mechanical propulsion of the blood into the legs, without increasing the heart's action.

Yd. *a* Arch St. 2 A. Fling. (Fig. 253). — Command, "*Arms forward — bénd! Slightly, trunk backward — bend!*" The trunk (and head) is bent backward a little. "*Arm-flinging — óne! Two!*" . . . The trunk being bent backward, the chest is more expanded than in the fund. pos. The movement may be combined with a leg-movement:

Yd. *a* Arch St. 2 A. Fling. w. F. Pl. Forw. — Command, "*Arms forward — bend! Slightly, trunk backward — bend! Arm-flinging, foot-placing forward — one! . . . Four!*" The trunk-flexion becomes deeper when the foot is advanced. The 2 A. fig. should at first be practised in arch wlk. *b* st. pos. And this and the preceding movement should first have been used as arch-flexions.

Yd. *c* St. 2 A. Circ. — Command, "*Arms sideways — lift! Arm circumduction — start!*" The arms remain straight, and move so that the hands describe a small circuit upward backward, downward forward. Inhalation takes place while the arms move upward backward, exhalation while downward forward, the movement of the arms following the rhythm of slow respiration. The movement should be one of the whole chest rather than one of the arms. Care should be taken not to move the arms too far forward. The movement is continued until the teacher commands, "*Stóp!*" This movement will be found to restore free respiration the most quickly after running, probably because the oscillatory changes of the axillary circulation rapidly diminish the general blood-pressure and the pulmonary congestion, the blood being "pumped" into the arms.

On the same principles are executed: —

Yard *c.* { **fallout** *b*, *d*. ; **turn** { **close st.** ; **st.** ; **stride st.** ; **fallout** *a*. } ; **arch st.** } **2 A. circ.**

Synopsis of respiratory exercises arranged according to types (for progressive list, see Appendix) : —

	St.	2 A. ext. sidew. (upw.).
	Fallout *b*, *d*.	2 A. ext. to yd. *d*.
		yd. *a* 2 A. flg.
turn	close st.	2 A. elev. sidew.
	st.	yd. *c* 2 A. circ.
	stride st.	yd. *d* 2 A. elev.
	wlk. *a* st.	2 A. elev. sidew. upw.
	fallout *a*.	2 A elev. forw. upw.

st. 2 A. elev. sidew.
yd. *d* st. 2 A. elev.
st. 2 A. elev. forw. upw.
st. 2 A. elev. sidew. upw. } with 2 heel-elev.

st. 2 A. elev. sidew.
yd. *d* st. 2 A. elev. } with 2 kn. flex.

yd. *d* courtesy sitt. 2 A. elev.

yd *d* toe st. 2 A. elev.
st. 2 A. elev. sidew. upw. } with 2 kn. flex.

yd. *a* 2 A. flg. { w. F. pl. forw.; w. ½ step *b*.; w. walking.; w. ½ step *a* and T. rot.

st. 2 A. elev. sidew.
st. 2 A. elev. forw. upw. } w. ½ step b.

close st.
st.
stride st. } 2 A. elev. forw. upw. w. T. rot.

arch st. { yd. *a* 2 A. flg.; yd. *a* wlk. *b* st. 2 A. flg.; yd. *a* 2 A. flg. and F. pl. forw.; yd. *c* 2 A. circ.; yd. *c* wlk. *b* st. 2 A. circ.; 2 A. ext. upw. w. sup. on bar.

RULES FOR MAKING TABLES OF EXERCISES.

ONE of the most difficult duties of a teacher of gymnastics is that of making tables of exercises — and every teacher is expected to provide his own. For no one can prescribe a set of tables that will be suitable for every class, even under tolerably similar conditions of teaching, since no two classes nor any two teachers are alike. Moreover, every teacher will

need new tables for every class he conducts; for even if all the suppositions on which his tables are based should remain the same for any two classes, he himself will differ enough in his teaching to necessitate a modification of prearranged tables.

The manner of proceeding in making up a plan of exercise or a set of tables will be something like the following: —

First cut a number of papers ("cards"), each large enough to hold the names of from nine to fifteen exercises written under each other. The cards should be numbered. Each one is intended to hold one table of exercises, and twenty-four of them will suffice; for, counting the winter season (during which the exercises are usually taken) as six or seven months, twenty-four tables of exercises will be enough to last through the season, since one table is to be used for a week at a time (besides, legal holidays and other intermissions must be counted out). Estimate the nominal average of physical development of the class, taking into consideration the individualities of age, sex, strength, nationality. Then fill in the exercises on the "cards" on the following plan: for instance, take the shoulder-blade movements. Look at the progressive table of these exercises, as given in this book, and estimate about how far the class in question will be able to proceed in these exercises in the given time, bearing in mind that the more rapid the progression can be made, the better, since physical culture should be acquired in the shortest possible time. Let us suppose exercise No. 15 to be considered the limit of the progress in one year; write this exercise down in the proper place on card No. 24, and then spread the other fourteen exercises over the remaining twenty-three cards, letting the difficult movements appear twice or more. In the same man-

ner, treat all the other classes of exercise, taking into consideration what apparatus there is at hand, what time is allotted to each lesson, how many lessons a week there are to be, etc. After all the exercises have been filled in in this manner, the tables should be compared with each other, so as to ascertain that every movement has had its necessary preparation, not only as regards the exercises of its own class, but also with reference to its relation to other classes. This revision will cause many changes of a more or less extensive nature. Then compare each table to itself, and adjust it so as to make its movements balanced in relation to each other, and so that there may not be too much sameness of commencing positions or movements. To prevent this it may become necessary to interchange movements from adjacent tables, and such exchanges can be made without greatly violating progression; for, in the progressive lists, out of three or four adjacent exercises it is well-nigh impossible, with any degree of accuracy, to determine the exact sequence. In this way, the teacher "constructs" a set of tables suitable for the class in question, and uses it for a guide, to be followed as closely as circumstances will permit; meanwhile being prepared to make any alterations rendered necessary by unforeseen conditions. For theory and practice are two widely differing things, and the teacher will find that as his work proceeds, his tables will suffer so many modifications that merely the background of his actual tables will resemble those theoretically constructed. For example, he may find it expedient to keep one exercise through a greater number of tables than he had at first planned; or he may have to postpone a movement on account of its producing too many faults; or he may find that the class develops faster than he had anticipated, etc. In accordance

with this, the tables printed at the end of this book must be considered only as samples, and not as regulation tables to be mechanically followed. An inexperienced teacher may begin by using these tables as they are written, but he will soon be competent to make his own and thus to put his individuality into the work, greatly to his advantage; for a teacher of gymnastics will be just as unsuccessful as any other teacher, if he makes himself into a machine.

If apparatus is at hand, each table should contain: introductions; arch-flexion; heaving-movement; balance-movement; shoulder-blade movement; abdominal exercise; lateral trunk-movements; slow leg-movement; jumping and vaulting; respiratory exercises, in the order enumerated. The first few tables, which for beginners must be very simple, naturally cannot contain all these classes; thus it will not be until the seventh or eighth table that the order can be strictly followed; and even afterwards the order need not be rigidly adhered to, since circumstances may necessitate many changes according to the teacher's judgment.

As the work progresses, various additions are made to the tables. Thus, for introductions may be used resp. exers., Leg-movs., A.-exts., lateral T.-movs., and exercises for attention and rhythm, one or more of each kind in every table, these being chosen from exercises which have been done before. Moreover, another heaving-movement may be added just after the slow leg-movements; two or more shoulder-blade movements are introduced to follow the marching and running; several jumping and vaulting exercises may be placed in the same table; two or more lateral trunk movements may be used, etc.; so that a lesson for an advanced class may contain as many as twenty different exercises, whereas one for beginners should have only six or seven.

If no apparatus is at hand, some kinds of exercises (heaving-movements, vaulting, etc.) have to be entirely omitted, and others will have to be used as substitutes. This somewhat changes the order of exercises in each table (see Part I. "Progression"), and many movements of the same class have to be applied in the same lesson. These should then be placed as far apart, and made as different in character, as possible. Under such circumstances, the free-standing arch-flexions may be placed in the middle of the table, and on each side of them leg-movements, lateral trunk-movements, shoulder-blade movements, etc. In a schoolroom where for some reason the teacher is not allowed to use the chairs and desks as apparatus, the tables have to be made out according to the plan just described.

If the exercises are to be taken between the recitations for a period of about five minutes, more or less, there will not be time for more than a leg-movement, a 2 A. ext., an arch-flexion, and a lateral trunk-movement, or four or five other exercises chosen according to the needs of the class. This arrangement may do for very small children (six or seven years of age), but for all others it is of small value, even though it be better than no exercise at all. To have any lasting effects, the gymnastic exercises should occupy at least half an hour a day put into *one* lesson. And it would be strange if that much time could not be easily spared from the theoretical exercises for the sake of the physical welfare of the school-children, all the more since the time "lost" will be regained through the pupil's better ability of brain work when his body is working at a higher rate of health; for, after all, "mind" merely expresses the functional activity of nervous tissue. In the history of man, the fact stands out in bold relief, that a race, mentally gifted or physically developed, has survived only if its repre-

sentatives were physically stronger than their competitors; whereas a physically degenerated race, no matter how brilliantly endowed otherwise, soon ceases to hold the lead in culture and civilization. The histories of the ancient peoples all bear witness to this.

Marching and running should be applied in every lesson, if the room admits of such exercises. They are best put in the middle of the table, just after the shoulder-blade movements (or, if two shoulder-blade movements are used, between the two); and they should be immediately followed by a slow leg-movement or a respiratory exercise, whenever the teacher deems it necessary. If possible, the marching and running should always take place out-of-doors (in the school-yard, in the yard connected with the gymnasium, etc.), partly because there is more space, but especially because there is more air, more oxygen.

When tables are made out for advanced pupils, — those who have practised gymnastics for several years, — it is not safe to begin at once with heavy exercises, even though they have been done before. If there has been a month or more of rest before the lessons begin, the first few tables should have an introductory character; but the progression may instead be made more rapid. Each step forward in the various classes of exercises is made longer; and every exercise, previously practised and now repeated, should be done to utmost perfection. In this way each movement may, from year to year, in a measure serve as its own progression.

It is desirable that the teacher, before beginning the lesson, should make himself so familiar with the table of exercises he is going to use, that he knows it by heart. A teacher who has many different classes, however, could not well com-

mit to memory all the tables; for that reason he may carry a memorandum of the exercises written on a small card (the size of a visiting-card), which he can easily hold in his open hand, and yet use that hand to correct or to illustrate a movement. He should take care, however, not to consult this card too often, as he is expected to have his eyes on the class almost incessantly, so that attention and discipline may not diminish.

The transition from one table of exercises into the next should not be made abrupt, but so that as soon as one exercise has been "acquired" the corresponding one from the next table is introduced. In this manner movement after movement becomes exchanged until one table has completely merged into the next one. This table is then applied in its entirety until its movements are gradually dropped for those of the next, etc. In this manner a very exact and even progression can be produced, and monotony and automatism of movement can be prevented; but it will be readily seen that the actual tables used will soon differ materially from those theoretically constructed at the outset. The method is not so convenient for the teacher as that of exchanging table for table, but the effects of the exercises will be far better, and well warrant the additional effort spent in teaching.

PART III

APPENDIX

APPENDIX

DISCUSSION OF SOME MECHANICAL DETAILS.[1]

Wg. pos. — A rule in Swedish (rational=scientific) gymnastics is to let the purpose decide the mechanics of the exercise, and to polish its appearance only as far as correct effect allows.

About wg. pos. the late Prof. H. Ling[2] says [Allmän Rörelselära, 1866, Page 212]: "A correctly executed hips-firm, i.e., with the shoulders drawn moderately backward, provides a firm support for the shoulders, and a steady insertion for the pectoral muscles, to produce more complete respiration without a distorted raising of the shoulders, which is a *fault* reminding of disease and expressly forbidden in the handbook of free exercises which first appeared with us,[3] but which is used in other methods as a special exercise. That is, the object of 'hips-firm' is to give those muscles which run from chest to shoulders, arm, etc., a support [reversed origin], thus more readily and decidedly to react upon the powerful carriage of the chest."

[1] Reprinted from *The Posse Gymnasium Journal.*

[2] Hjalmar Ling, M.D., the son of P. H. Ling [the originator of Swedish gymnastics] was born in 1820 and died in 1883. He was professor of Educational Gymnastics in the Roy. Gymnastic Central Institute from 1864 until his death. He was an eminent scientist, while his father was a philosopher; and he is to be considered as the first authority on the science of Swedish Gymnastics and General Kinesiology.

[3] Written by the elder Ling.

The object, then, is to make the hip carry the arm so that the sternal insertion of the pectorals should be the moving end, the humeral the fixed one; consequently the hand should be resting on the hip, and should not merely grasp the waist, while the energized shoulder muscles carry the arm. Fig. 32 is a copy of a drawing from the pen of Prof. Hj. Ling, and is taken out of the standard Swedish collection of gymnastic illustrations;[1] consequently it must be considered as representing the correct position.

The dissenters [not one of whom is a graduate of gymnastics] maintain that wrist and forearm should be in a straight line, as in Fig. 254, and claim as their authority the illustrations in Major V. G. Balck's book on gymnastics [from which Fig. 254 is copied]. These illustrations were not drawn by Major Balck,[2] but by an artist, Bruno Liljefors, who is entirely unacquainted with the details of special kinesiology, even though he may be an excellent practical gymnast. His drawings are apparently sketches from life, the models probably being members of the Stockholm Gymnastic Association [of which Liljefors is, or at least was, a member]. Now, it is characteristic of athletes that radio-ulnar flexion of the wrist is lessened or even absent.[3]

It is a well-known peculiarity of the Swedes [in Sweden] that they pay small attention to details; and it is more than probable that Major Balck overlooked the position of the hands in these drawings, or considered that every one would

[1] Atlas till Gymnastik Reglemente för Kongl. Flottan.

[2] The writer, who claims Major Balck as a personal friend, and who has had him for teacher as a schoolboy, as a student in the R. G. C. I., and as a member of the Stockholm Gymnastic Association, cannot recall ever having been taught any other wg. position than that shown in Fig. 32.

[3] The author's experience in the Scand. Gymnastic Club of Boston tends to prove this fact.

understand why the athlete was forced to hold them in this manner, so that when they attempt the position shown in Fig. 32, they produce that of Fig. 254. Probably that was the case with Liljefors' models. Nothing is said in the book about the posture of the wrist, only that "both hands quickly grasp the hips with thumbs behind; the elbows in direction of the clavicles, i.e., moved slightly outward." When children are taught to keep forearm and wrist in a line in wg. position, they very soon assume the position shown in Fig. 255, which, according to Ling and common sense, illustrates faulty posture; and that which tends to faulty posture should be excluded from gymnastics. Besides, when the position of Fig. 254 is assumed, and volition rather than muscular resistance prevents the descent of the hand, the pectorals become engaged to carry the arm, the sternal end is fixed, the humeral movable; which is the reverse of what Ling prescribed, i.e., the object of the position is missed.

FIG. 254. — WG. POS. AS IT LOOKS IN THE STIFF ATHLETE.

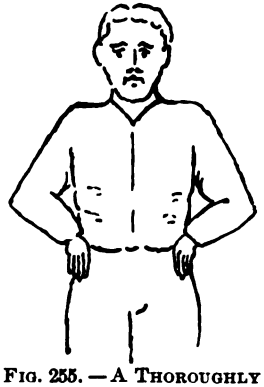


FIG. 255. — A THOROUGHLY INCORRECT POSTURE.

We leave it to the reader to decide whether Bruno Liljefors is better authority than Hjalmar Ling; whether a rigid chest, shoulder, and arm are preferable to flexibility, ease, and grace of posture; and whether the statements of self-taught teachers of gymnastics are of more value than those of a graduate from Sweden's only normal school of gymnastics.

Head Flexion Backward. — In natural position of the head,

the neck is slightly arched, with the convexity forward. Continued muscular inattention will cause this curve to increase, and the head will sink forward; the upper attachments of the sterno-cleido-mastoids and the scaleni will descend, and consequently those parts which are suspended from these muscles, the sternum and first two ribs, will sink. This depression of the clavicular chest is the first step toward a shortening of the pectorals, with a diminution of respiratory capacity. To counteract this effect of gravity and muscular relaxation, the movement of head-backw. flex. has been introduced into gymnastics. Yet it is the raising of the head after backw. flex. rather than the last-named movement itself, which is the essential part of the exercise. For, if the chin is drawn in while the head is being raised, the occiput, with the attachments of the sterno-cleido-mastoids, becomes pushed backward — upward, and there will occur a tension in the muscles named, causing the sternum to be lifted. The effort of drawing the chin in radiates sufficiently into the sterno-mastoids to prevent their passive extension during the movement, which thus not merely has a *tendency* to lift the chest, but definitely lifts it. It is true that if the chin is drawn in while the head is being bent backward, there is an effect in the same direction; but, as the mastoid process no longer performs the function of a pulley (changing the direction of the power and lengthening its lever), the effect is greatly diminished. On the other hand, the rigidity of the anterior cervical muscles produced by the difficulty of the movement, causes a compression of the large veins with a consequent increase of blood pressure in the head. If the effort in drawing the chin in is sufficiently strong, the gymnast will receive a sensation as if the top of his head were being forcibly pushed upward; and repeated

execution of the movement in this manner will produce a headache, an effect which we must pronounce physiologically, and hence gymnastically, incorrect. Consequently, we claim that during backw. flex. of the head, no special effort should be made of drawing the chin in, for when executed in that manner there is no noticeable effect of such increase of pressure; and it is evident that in those gymnasia where the movement has produced a headache, it has been incorrectly executed. In conclusion, it might be said that the backw. flex. is done merely to provide a commencing position for the return movement, and that it should occur by letting the head fall back (yet taking care that the chin is not pushed forward), while, during the raising of the head, the chin should be drawn in.

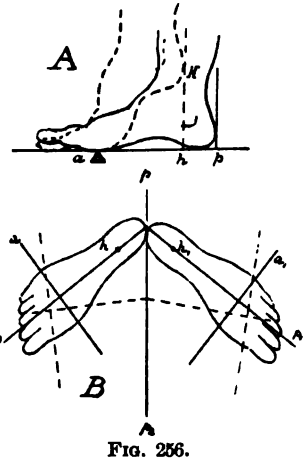


FIG. 256.

Double Heel Elevation. Should the Heels be held together or not? — The raising of the heel occurs around an axis (a) at right angles to the longitudinal axis of the foot (Fig. 256 A, a). It is evident that the projection of the heel (h) will fall the nearer this axis, the higher the heel be raised, and that the projectors will be in a plane (a p H) at right angles to the axis of motion (a).

If the feet are placed in fund. pos., i.e., with heels together and at an angle of 90° (Fig. 256 B), it is evident that the axes of heel elevation (aa_1) will cross each other at nearly 90°. If the heels now be raised, the projectors (h and h_1) of each will travel along the respective lines pp and pp_1 and not along the

common line pp_2; i.e., h and h_1 will move apart proportionately as the heels rise. In other words, the heels come the farther apart the higher one rises on tip-toe. This is the natural result if the balls of the feet remain in original position.

In order to bring the projectors of each heel into one and the same plane, pp_2, it would be necessary to change the direction of the axes a and a_1 proportionately to the elevation, in other words, to rotate the balls of the feet outward (as indicated by the dotted lines in Fig. 256 B). This would mean that the heel elevation should be accompanied by a voluntary outward rotation of the thigh. The question naturally arises, does this improve the movement? It does not. For the object of the movement is to throw the line of gravity of the body forward with utmost speed while diminishing the base, so as to bring the extensors of the body into the strongest and most sudden contraction: to cultivate the power of equilibrium; and if part of the attention is taken up by the effort of keeping the heels together and rotating the feet outward, it will be found that the speed of motion will lessen, and consequently part of the desired effect will be lost. For the effect of this movement as a balance-movement is proportionate to its speed of execution. Ling's general rule to "prefer the simple to the complex" well obtains here; and since the object of the movement is not merely to take the heels off the floor and to hold them together, we must consider it correct to allow the heels to come apart, all the more since it is never permissible to change the position of the feet during the execution of a leg-movement, unless anatomical conditions enforce such a change. The plate in the standard Swedish work[1] seems to corroborate our view of the question, although

[1] Plate I. 2 = Fig. 30 in this book.

the partial side view makes it indistinct. Careful research has failed to produce any statement by Ling to the effect that heel elevation should be accompanied by an outward rotation of the thigh; and it would be interesting to know if the dissenters introduce this addition also in close st., stride st., and walk st. pos., and if not, what the reason is for their inconsistency. For as far as we know 2 heel elev. should always be executed the same way, no matter what the commencing pos.

Courtesy St. and Courtesy Sitt. Pos. — From 2 heel elev. the knees may be bent to 90° (courtesy st.). While the knees bend, the heels gradually descend (yet not to the floor) until they touch, as in Fig. 36, copied from the standard work.

But when the knees bend beyond 90° the heels again separate, partly because the deeper flexion causes an increased elevation of the heel (compare Fig. 256), partly on account of the anatomical construction of the knee-joint. For according to all good authorities, flexion of the knee is accompanied by an inward rotation of the leg (caused by the greater length of the internal condyle of the femur, and by the pressure exerted upon the posterior crucial ligament), which rotation becomes the most distinct after the flexion passes 90°. When Hjalmar Ling drew Fig. 39 (copied from the standard work) he evidently remembered these facts, as the separation of the heels is well emphasized in the drawing; — and Ling and the laws of the human body must be considered excellent authorities.

Slow Leg-movements. — The slow leg-movement has the object of diminishing or equalizing the blood-pressure and thereby lessening the heart beat. This effect is obtained from any movement where the blood becomes mechanically

drawn forward in the veins; and if a slow leg-movement is to be what is claimed for it, it should have this effect. Now, if a vein is moderately stretched, its diameter does not diminish (Lovén); i.e., its total capacity increases, and it will fill with blood from the distal side. Thus, if a group of muscles is being passively stretched, the venous current through the region must increase; and it follows that the *vis-a-fronte* in proximal arteries will also increase; consequently, the resistance to the heart's action diminishing, the frequency of the heart-beat will lessen.

If one foot is placed in advance of the other, and the body is bent as far forward as the ligamentous action of the muscles will allow, such an extension occurs in the posterior muscles of the advanced leg. In fallout c. pos. there is a similar action in the calf of the backward leg.

These are typical slow leg-movements, and have the effects named above.

A different condition obtains in movements like St. 2 Kn. flex. It is true that when executed with ordinary speed (a little less than in the regulation prep. to jump), there will be an increased current (both efflux and afflux) through the legs, and that consequently there will be a diminution of supply in the thorax, so that the movement will have a slight effect of lessening the heart-beat. But supposing the flexion were done slowly: then the muscles would be in a continuous state of contraction, and hence there would be an increasing resistance to the arterial current. The frequency of the heart-beat would at first lessen; and so we might be deceived into thinking that the effect of "slow leg-movements" had been obtained. But a closer inspection would show an increase in force of the heart-beat; and if the movement were long con-

tinued there would also ensue a greater frequency. Consequently this movement is not a "slow leg-movement," even though its rhythm be slow.

Heaving-movements in the early part of a lesson are followed by balance-movements. These have a slight effect of diminishing arterial pressure, and so may overcome the *excess* of increase produced by the heaving-movements. Some increase is desirable; since the heart has to be trained as other muscles by gradually having more weight to lift — if gymnastics do not strengthen the heart, they fall short of their purpose — and it is only the excess which is removed by the balance-movement. If at this point in a lesson more effect in this direction is needed, the balance-movement is out of place, and should be substituted, or at least preceded, by a slow leg-movement.

On the other hand, toward the end of a lesson, if preceding movements have been gentle and the jumping is not of a violent nature, the slow leg-movement should be eliminated, as then there is no increase of pressure to overcome; and it would only tend to hasten the pulse and diminish the force of the heart's contraction if the *vis-a-fronte* were to be forcibly increased. In such a case the slow leg-movement would merely tend to weaken the heart; and if a leg-movement nevertheless is desirable (as a change, etc.) in this part of the lesson, it should take the form of a balance-movement, or of a leg exercise in slow rhythm as described above.

In conclusion we would say: 1. That the term "slow leg-movement" is a misnomer, and that we advise the invention of a better name; 2. That slow leg-movements are needed only when the blood-pressure has become abnormally high (beyond the normal limit of fatigue in the heart); 3. That they should be entirely omitted in gymnastics for beginners,

unless especially indicated; 4. That any movement producing a passive extension of leg-muscles is a slow leg-movement, whether this tension is caused by trunk, arm, or leg-movement; 5. That T. forw. flex. and fallout *c* pos. form the types, and that balance-movements can be used as slow leg-movements only when being modelled after these.

This discussion may differ somewhat from the average understanding of this class of exercises; but it may help to dissipate the misconception which has led to a condemnation from scientific investigators, viz., that a "slow leg-movement" was any leg-exercise executed in slow rhythm.

Remember that in gymnastics, it is effects, not. names, by which we should judge.

Unilateral Arch-flexions and Abdominal Exercises. — In elucidating the mechanics of gymnastic movements, and deciding what should constitute their correct execution, first determine the purpose of the exercise, and then construct the commencing position and movement in such a way as to accomplish that purpose. Any change of commencing position or of movement in order of progression, then, should have the object of intensifying the effects aimed at — or, inversely, a diminution of effect by change of position constitutes a retrogression: —

(*a*) **½ Str. Wg. Wlk.** *b* **St. Arch-flexion. Which Arm Should be Extended Upward?** — In arch-flexions the object is to extend the epigastric region and to spread the false ribs apart. The change from wg. to (yd. *c* to) ½ str. wg. pos. causes an increased tension by lengthening the lever of the weight; so that the side having str. pos. becomes much more arched than that having wg. pos. (compare Fig. 62). It is evident that this effect will be intensified if the leg of that side is moved backward, diminished if it is moved forward; since in the first case

the lower insertions of the tense muscles move down, in the last they move up (the fascia of the thigh relaxing). In that manner, if the leg were moved forward, the increase of tension gained by stretching the arm of that side upward would be partially lost; i.e., the effect aimed at would be missed, and the mechanics must be considered wrong, or the movement at least useless. For that reason the ½ str. pos. should be taken on the side of the backward foot (the wlk. *b* st. pos. being taken by advancing one foot) in order that the utmost increase of effect should be gained by the change of commencing position, and that the latter should have full reason for existing.

If the opposite arm is used, not only is there a diminution in the total effect of arch-flexion, but the tension changes from sagittal to oblique, and now takes place from Poupart's ligament of one side to the coracoid process of the other. The command for the correct movement then is "Hips — fírm! Left foot forward place and right arm upward stretch — one! Twó! Trunk backward — bend!" etc.

(*b*) **Oblique Gr. Arch St. Kn. Upw. Flex., L. Elev., etc. Which Leg Should be Raised?** In oblique gr. arch st. pos. (Fig. 72) the body is arched backward toward the stall-bars, the arms are extended upward, and the hands grasp the bars at different levels (one hand is one bar or more below the other). It is evident that the arch is the strongest on the side of the lower hand, the plane of the hands being parallel with that of the heels (and hips); and that an oblique tension has been produced in direction of the lower hand, the trunk rotating somewhat to that side. A movement done from any commencing position whatever should intensify the effect of the position (or the position that of the movement); so that, in this case, whatever movement is executed, its purpose will

be to increase the oblique tension. Besides by 2 Heel elev. this can be done either by moving the low hand still farther down (which needs no discussion) or by actively flexing the hip of the opposite side. For if this hip is flexed (compare Fig. 73), not only do the psoas and iliacus contract, but the anterior muscles of the abdomen (those "inserted" into the so-called Poupart's ligament, and whose aponeuroses are in reality continuous with the fascia lata) assist these and perform most of the lifting. But while they raise the leg, they also tend to move their upper attachments down; and the flexion of the hip cannot become distinct until the upper ends have ceased moving, i.e., until the limit of extension of the epigastrium has been reached: the linea alba is subjected to a tension in direction of the flexing thigh. But this linea was already stretched toward the low hand, and consequently the raising of the opposite leg has emphasized the effect obtained by the commencing position. [The tension increases still more if the leg is raised into cr. *b* pos. (compare Fig. 74) instead of cr. *a*, the lever of the weight — considering the contracting muscles — growing longer; and with either movement, if heel elev. of the supporting leg is added, the arch increasing as its toggle joint, the ankle straightens.]

If the leg on the side of the low hand were raised, this would increase the tension of that side, and the arch-flexion would become sagittal for that side instead of oblique for the chest as a whole. The primary object of the commencing pos. would then be lost, and the effect of the movement could be obtained in a much simpler and more definite manner. Consequently the "diagonal" movement must be considered correct, the "parallel" one incorrect.

(*c*) ½ **Str. Wg.** { ½ **Kn. St.** / **F. Gr.** ½ **St.** } **T. Backw. Flex:** —

Which Arm Should be in Str. Pos.? — In abdominal exercises the purpose is to bring into contraction the muscles of the abdomen; and any progressive change of commencing position should intensify this effect. In ½ Kn. st. and in F. gr. ½ st. backw. flex. (Fig. 158 and Fig. 163) the vertical group of abdominal muscles on the side of the anterior leg carry the falling weight, those of the posterior leg merely fix the linea alba, and secure equilibrium of the body below the hips: the effect of abdominal exercise will be confined chiefly to the side of the advanced leg. Any one-sided lengthening of the lever of the weight should then occur so as to increase the exertion of those muscles which are the most active, i.e., those of the side of the advanced foot, so that ½ str. pos. is taken only to that side.[1] If it were taken to the opposite side, it would increase the ligamentous action of the muscles of that side more than the contraction of those of the other, and would produce an effect of arch-flexion rather than one of abdominal exercise. It is true some increased contraction of the carrying side would set in; but, the centre of gravity having moved diagonally, oblique instead of sagittal resistance would be introduced, and the typical characteristic of abdominal exercises would be lost.

(*d*) **Stoopfall Alt. A. and L. Elev. Which Arm and Leg Should Rise?** — When from stoopfall pos. one leg is lifted from the ground, the contraction of the abdominal muscles of the other side must increase, in order to prevent the falling of the pelvis: that side becomes the carrying one, and the abdominal effects will be confined largely to it, the other being passively extended as the leg rises, the linea alba being drawn toward that side: there is a gain in muscular fixation partially making

[1] Compare "The progression of 2 L. elev." below.

up for the loss of fifty per cent of the carrying power. The upper insertions (origins) of the contracting muscles are steadied by the hand on the ground fixing the ribs. But if this hand is removed and carried by the shoulder-muscles, the fixed ends become unsteady, and consequently the contraction must change into an oscillation of ever-changing rhythm: the exertion of the carrying muscles is one not merely of increasing co-ordination, but, the arm rising forward, the lever of the weight increases, and a more powerful contraction must occur for the same equilibrium. If the other arm were raised, in order to secure equilibrium, the trunk must rotate to that side, and we would practically have to deal with a lateral trunk movement (rotation into ½ str. side fall. L. elev.) instead of an abdominal exercise. That is, in stoopfall alt. A. and L. elev., the arm and leg of opposite sides should be lifted together. This, also, conforms to the natural forms of locomotion in man and quadrupeds, the opposite limbs moving together.

The Progression of Lying 2 L. Elev. — A muscle whose origin has been drawn away from its insertion, contracts more easily, for, if stretched in the commencing position, its elasticity will assist the motor impulse; and, also, a less contraction will be required if the height and weight lifted remain the same. It then becomes obvious that the progression of positions of the arms for this movement will be from str. gr., to str. (the str. gr. giving a more fixed origin), to rest, to wg., to fund. pos., the chest, and consequently the origin of the rectus abdominis, etc., descending with the arms. The progression here consists in bringing the arms down, so that if ½ str. ly. alt. L. elev. were to be given, the ½ str. pos. would be taken on the side opposite that of the moving leg.

Next we must consider the three forms of muscular activity. If the legs are lifted with straight knees from the floor to vertical (Fig. 155), and then lowered, the muscles shorten (concentric action) during the first motion, lengthen (excentric action) during the second, the raising being harder than the lowering, it being easier to give up to a resistance (gravity) than to overcome it. For beginners, it would then be desirable to start from the second position, and to practise the letting down alone before attempting the lifting. To that end let the pupil draw his knees up, sliding his feet on the floor, and then tipping the knees up over his chest (count "one!"); then stretch the knees into cr. *b* pos. (count "two!"); and from there lower the legs (count "three!") until they rest on the floor.

This movement is called "excentric 2 L. elev."; and while it may be eccentric to call the lowering of the legs an elevation, yet from a muscular and motor stand-point, it is correct, as long as the elevator muscles are energized, even though they are giving up to the weight. (If the legs were dropped to the floor with relaxed muscles, or if they were brought down under resistance of a force tending to lift them, the movement would be the reverse of elev.). When proficiency has been acquired in this movement, it is tried concentrically; first with slightest elevation; then with elevation to 90°; and at last to 45°, where a pause of periodically increasing length is made. From this position 2 L. abduct. may finally be tried in order to make the statical contraction still more severe.

Before 2 L. elev. is attempted in any form, L. elev. should be practised, especially for women and others with weak muscles favoring rupture and displacement.

Cr. *a* ½ st. pos. and Kn. ext. forw. (to cr. *b* pos.); and Str. gr.

cr. *a* ½ st. Kn. ext. forw., are all introductions to ly. 2 L. elev., and its derivatives.

While 2 L. elev. is a most useful and desirable movement, it is well to exercise care in its application, as strains readily occur where the moment of weight is great (as compared to that of the power) and the muscles unused to exertion.

The Execution of Lateral Trunk Movements: — (*a*) Trunk Rotation. Should the Hips be Kept Still? — We frequently hear the command "Trunk to the left 'twist'; keep your hips still," and the pupils in their efforts to carry out the order are seen to go through the most peculiar contortions. For as a matter of fact muscular isolation, if not provided by the commencing position, is produced by an effort to rotate the pelvis to the opposite side, and the command ought then more properly to be "Trunk to the left and hips to the right twist." Now, it is a fact that for T. rot. Ling used as commencing positions Close st., St., Stride. st., Wlk. st., Fallout st., Kn. st., and Ride sitt. in the order enumerated; and that his object in changing commencing pos. when the lever remained the same was always to produce an increase of muscular isolation, a difference of gymnastic effect. But if the hips were to be kept still, these commencing positions would have produced no difference of movement except to make the last movement easier than the first, a form of progression totally foreign to the Ling system. The prevention of monotony by such changes of leg-position would not have appealed to Ling any more than it would to any one else, and hence that could not have been his object. If the commencing position is left to take care of the hips, the purpose becomes apparent. For while in fund. pos. the pelvis rotates freely on the thighs and adds some 40° to the movement of the dorsal

region,[1] a change into stride st. and wlk. st. pos. gradually excludes the rotators of the thigh from the movement, until in ride sitt. pos. the rotation occurs in the dorsal region alone. If this final isolation were possible or desirable already in fund. pos., Ling would have had no use for the other commencing positions. Even if such an isolation is possible to an expert, it would be absurd to demand it in a beginner. For (1) It would require a degree of co-ordination scarcely to be expected from anybody; and (2) The mobility of the dorsal vertebræ in anybody, and especially in the gymnastically untrained, is so slight that there will hardly be any motion at all unless the lower ends of the rotators are firmly fixed by some power stronger than antagonistic resistance of contraction; (3) The object of the movement is to expand the chest; to produce internal elevation; and to produce mobility of the waist. And, so far as we can make out, when the isolation is produced by muscular contraction instead of by passive tension, these effects are absent, and the only ones produced with any degree of distinctness, are acute pain in the quadratus lumborum, lordosis, holding of the breath, and flexion of the proximal knee. Besides, the movement is directly opposed to the correct action of the tensor vaginæ femoris in graceful walking, which is to rotate the pelvis to the side of the advanced foot, not the reverse, which latter produces either a rigid walk, or one peculiarly snake-like, where the shoulder turns one way, the hips the other. (Every skilled horseman has probably experienced the ugliness of the corresponding fault in unbroken horses.) Ling's general statement that "Creation has minutely decided the physiological limits of isolation," and that "that which is simple and easily

[1] It is to be remembered that rotation is absent in the lumbar region.

understood should be preferred to that which is complex," ought to have been sufficient to indicate his intentions as regards the mechanics of this movement. Our arguments will merely help to emphasize them.

(*b*) **Trunk Sideways Flexion. Should the Spine be Inclined to the Side, or Should it be Arched?** The purpose of the movement is not merely to tilt the body to the side so as to exercise the muscles of the waist. Ling did not construct any class of exercise for mere muscular effect, but to him gymnastics meant something more: it meant effect upon internal organs, upon functional activity; and in one of Hj. Ling's books we find the trunk-flexions spoken of as movements for the large vessels (*storkärlsrörelser*). The vena cava inferior is attached to the spine (on its right side) in such a manner that it must follow the movements of the spine (Professor Lovén). If the trunk is arched to the left, this vessel is on the convex side of the arch, and consequently becomes stretched. Meanwhile its diameter remains the same; i.e., its *capacity increases*.[1] If the trunk is arched to the right, the reverse condition obtains. Alternate flexion to each side would then affect the vena cava as would a force pump attached to it. This effect hardly occurs through the small change taking place at only one point, as when the trunk merely inclines without arching; and it is not likely that Ling could have intended that so desirable a result should be prevented from ensuing, and that the only effect to be gained should be muscular development. Furthermore, when the trunk is arched there is a decided spreading open of the ribs of the opposite side, causing an increased chest

[1] In accordance with Professor Lovén's experiments on living vessels. ["Hartelius Medical Gymnastics."]

capacity, which likewise disappears when the trunk merely inclines; and bearing in mind Ling's recommendation to multiply the lateral trunk-movements when there is no apparatus for heaving-movements, it is evident to us that Ling intended these exercises to have an effect towards chest development. Consequently we make the mechanics correspond to such intentions; and not only do we prescribe that the trunk should be arched to the side, but we claim that the movement should commence in the neck. For unless the head and neck are bent to the side there will be but little change in the dorsal region, and a straight neck would mean just so much diminution of effect; and, after all, it is for the effect, physical and physiological, that exercises are applied, not for the sake of forming straight lines, curves, and angles, or for the sake of upholding a statement made by some one in the heat of a debate. Perhaps Ling would not have explained the mechanics of these two movements in precisely the same way; but as our argument is rational, we are convinced that it would have met with his approval.

St. 2 A. Elev. Forw. Upw. — About the first motion, the raising of the arms, there can be but one opinion. But the "sidew. downw. — sink!" seems to be taught in different ways. On one side it is claimed that the palms should remain in supination until the arms are horizontal; then the hands are to be turned and the arms lowered, into fundamental pos. The opponents maintain that the hands should turn gradually while the arms are being lowered, without stopping at any point for this motion. The foremost advocate of the first method, Professor Törngren, gives as his reason, that as long as the palms are turned up we have a guaranty that the shoulder-blades are correctly poised, whereas we have none after pronation has commenced.

This reasoning might suffice as long as the exercise is used as a shoulder-blade movement, only that it may be questioned whether the supination does not retain the chest in expansion rather than flatten the shoulder-blade (unless the trunk is inclined forward, when the last effect is the stronger), and that the stopping to turn the hands diminishes the continuity and grace of movement and flavors of the jerkiness introduced by the same reasoners into 2 A flex. upw. or forw., etc.

But in a majority of cases this movement is used as a respiratory exercise; and in these the arm-movements are to be regulated as to rhythm and execution by the respiratory act. Now, the rhythm of normal respiration consists of a recurring inhalation, exhalation, and a pause; i.e., the pause of the arm-movement should occur after the arms have been lowered, and not in the middle of that movement, unless we also make the exhalation take place on the instalment plan — which, as far as we know, has not been demonstrated to be a physiological desideratum. That is, in order that the movement should be physiologically correct, the hands should turn gradually while the arms are being lowered without stopping. Besides, we consider it perfectly safe in a respiratory exercise to let the shoulder-blades take care of themselves, since the first motion provides for a good general posture; and we also think that the introduction of this extra motion detracts from the general purity and grace of the movement. The fact that Colonel Nyblæus — than whom no one had a finer "sense of gymnastic movements" — used to teach the gradual turning of the hands would have been argument enough for us unless the question had been put forcibly before us. Colonel Nyblæus' authority on the subject is unquestioned, and we are satisfied to leave the choice of argument to our readers.

MEDICO-GYMNASTIC EXERCISES USED IN EDUCATIONAL GYMNASTICS.

In every class pupils will be found who, through deformity or unusually poor development, are unable to proceed as rapidly as the others. To enable these to keep with the class, and to prevent them from checking the progress of the others, — since none are to be excused from gymnastics, except on account of incurable deformity or organic disease, which would be aggravated by exercise, — the teacher resorts to movements of a stronger and more corrective character, which he can apply individually to those especially needing them. These exercises are borrowed from medical gymnastics, and hence are to be considered as an appendix to educational gymnastics. Only the simplest and most common forms will be described, since it requires a special education to intelligently apply medical gymnastics — a knowledge that cannot be obtained by merely reading about the subject, and which cannot be expected in the average teacher of gymnastics.

Round Shoulders. — When the shoulder-blade movements fail to accomplish their object, the teacher applies the following exercise: The pupil stands facing the teacher with his arms in yard *c* pos., the palms of the hands turned forward. The teacher (in walk *b* st. pos.), standing close to the pupil, grasps the latter's arms near the hands (over grasp, if the pupil is small; under grasp, if he is tall), and pulls them forward into reach pos. under a moderate resistance. The pupil moves his arms back into yard pos. under resistance from the teacher; and, when the limit of voluntary motion is reached, the teacher presses the arms just a little farther backward. The movement, which is repeated five or six times, should be done evenly and not by little starts and pushes; and the teacher

should see that the pupil maintains good posture all through it. The exercise is called **yd. st. resistive 2 A. abd.** (Fig. 257). As the pupil gains strength, the commencing position should be made more difficult, forw. lying, stoop st., fallout *b*, and foot gr. fallout (Fig. 258) positions being used in the order enumerated. If the pupil cannot maintain the standing-position without leaning backward and curving in the lumbar region, he may sit while doing the movement; and, instead of stoop st. pos., the corresponding sitting position (Fig. 259) may be used, the latter being easier.

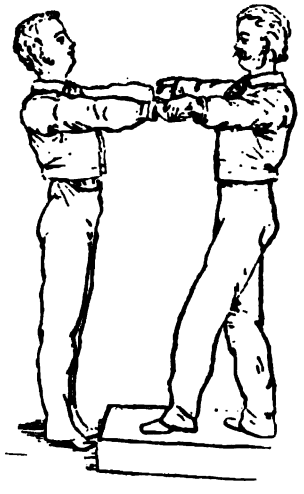


FIG 257. — YARD ST. 2 A ABD.

The corresponding exercise on chest-weights is a good shoulder-blade movement of localization when done in good posture; i.e., with arms horizontal, spine straight, and head well poised. The st. pos. (trunk vertical) is useless for this movement, as it leads to lordosis.

Drooping Head. — If the free-standing head-flexions, etc., are not sufficient to make the head stay in good erect posture, the following movement is applied: The pupil stands facing the teacher, who places his hands, one upon the other, behind and against the pupil's head (Fig. 260), letting his forearms rest on the anterior part of the pupil's shoulders. The pupil bends his head forward and then pushes it backward as far as it will go, the teacher offering a moderate resistance against the backward movement, thus bringing the muscles of the neck into stronger activity. When the head moves backward, the chin should be drawn in, for then the insertion

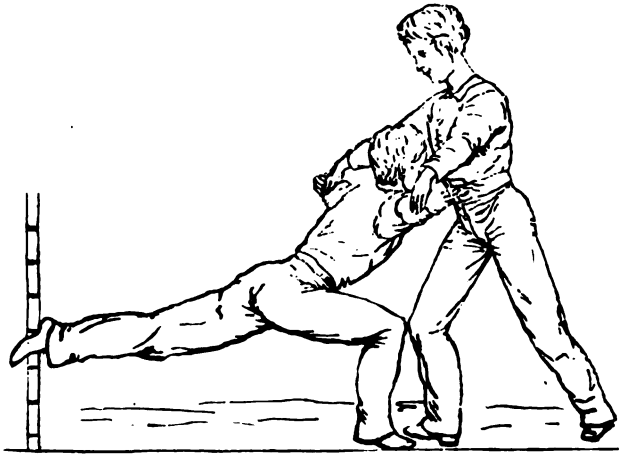


FIG. 258. — YD. FOOT GR. FALLOUT 2 A. ABD.

FIG. 259.
YD. STOOP SITT. 2 A. ABD.

FIG. 260.
ST. RES. H. BACKW. FLEX.

(gymnastically speaking) or origin (anatomically speaking) of the sterno-cleido-mastoid muscle is moved backward, and a tension is produced in this muscle which causes an elevation of the superior part of the sternum. Thus the exercise not only corrects the posture of the head, but it also tends to expand the chest. The movement, which is repeated five or six times in succession, resembles free H. backw. flex., except that the head is pushed backward without the face turning up. (Compare "H. backw. flex." in the Appendix.) In the free exercise the backward movement is done only to get a commencing position for raising the head, while the reverse obtains in the resistive movement. The reach gr. st. pos. may also be used as commencing pos.; the teacher then stands on one side of the pupil, steadies him with one hand, and resists the neck-flexion with the other. The movement may also be taken in a stoop fall. pos., obtained from the reach gr. st. pos. by moving the hands a few bars downward and the feet backward on the floor (or on a bench or other elevation), the position growing in strength as it comes nearer to horizontal stoop fall. pos. When done in stoop fall. pos., the exercise has a far more extended effect; for now it is also an abdominal exercise, a good posture calling for strong contraction of the abdominal walls, which contraction must increase as the head bends backward, or the position is lost. As a drooping head is usually accompanied by a protruding abdomen, the stoop falling neck-flex. is very effective in correcting not only the head but the general posture as well. Besides, this exercise reaches farther down the spine, and is more efficacious in straightening the dorsal region. When the stoop falling position is nearly horizontal, the teacher gives the pupil a slight support by one hand placed under the latter's abdomen, the other hand resisting the neck-flexion (Fig. 261).

It has been proposed that this exercise be done by the pupil himself making resistance against his own movement, with his hands locked behind his head. The effect of such a method is to strengthen some of the muscles of the arm; but for invigorating the muscles of the neck, it is well nigh worthless. The whole procedure forcibly reminds us of how the famous Baron Münchausen pulled himself and horse out of a swamp

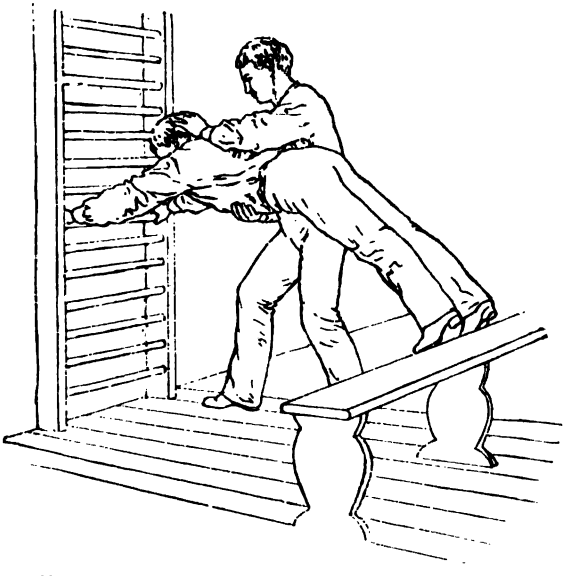


FIG. 261. — STOOP FALL. RES. H. BACKW. FLEX.

by taking hold of his own "pigtail," and by that means lifting himself and horse until they reached firm land.

Flat Chest. — This is best corrected by heaving-movements, shoulder-blade-movements of expansion, and respiratory exercises; if, however, it is desirable to hasten the effect, the following exercises can be used: —

1. **Wg. St. 2 Heel-elev. w. Chest Expansion.** — The pupil takes

"hips firm." Standing behind him, the teacher takes hold of his arms just above the elbows; and, while the pupil rises on tip-toe and inhales, the teacher pulls his elbows backward as far as possible without tipping him backward. In this way the chest becomes forcibly (and passively) expanded, so that it can hold more of the in-rushing air. The pupil exhales, and lowers his heels, while the teacher lets the elbows resume commencing position. The movement is repeated from five to ten times. It is best to use the command, "*Heel-elevation with respiration — One! Two!*" . . . Care should be taken to apply the pressure neither up nor down, but at right angles to the spine, for otherwise bad posture of the shoulder-blades will result.

FIG. 262. — STR. GR. ST. CHEST EXPANSION.

2. **Str. Gr. St. Chest Expansion** (Fig. 261). — The pupil stands close to the stall-bars, with his back turned to them, and grasps as high as he can reach without rising on tip-toe. The teacher stands in front of him, and, bracing himself with one foot against the bars, he applies both hands to the pupil's back (between the shoulders). By letting his hands slide downward and forward, he pulls the pupil's trunk forward into arch pos., the pupil rising on tip-toe. During this operation the pupil inhales; and he exhales as the teacher lets him fall gently back into commencing position. The movement extends the whole front of the body, and vaults the chest forward. If vertical poles (whose lower ends are fixed) are at hand, the pupil takes str. gr. st. pos. between them; and, standing behind, the teacher pushes the pupil's body

forward and upward, with one hand applied in the middle of the back just under the shoulder-blades (Fig. 263). When done in this manner, the movement gives a little more elevation to the chest than is attained when the stall-bars are used. A narrow doorway will answer the purpose of vertical poles.

FIG. 263. — STR. GR. ST. CHEST EXPANSION.

3. **Reach Lying Passive 2 A. Elev.** (Fig. 264). — The pupil lies face up on a bench (or other elevation), and places his arms in reach pos. The teacher, standing behind, grasps the arms around the wrists and pulls them backward into str. pos., while the pupil inhales, and lifts them forward into reach pos. while he exhales. The movement — which is repeated six or eight times — expands the lateral parts of the chest and vaults it upward. The effect is increased, if the pupil makes a slight resistance while his arms are being pulled backward.

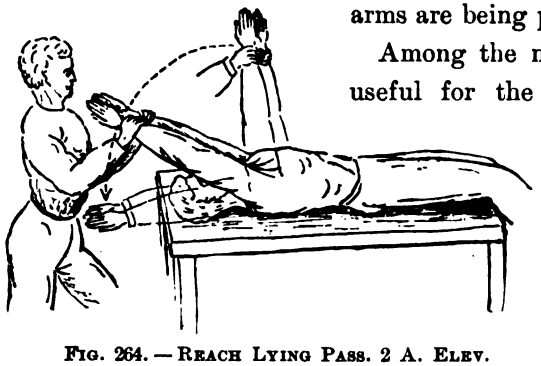


FIG. 264. — REACH LYING PASS. 2 A. ELEV.

Among the numerous exercises useful for the stretching of the pectorals, introd. to cr. hang. pos. (see heaving-movements) is one of the best and most efficacious.

Lordosis. — By this name we understand that condition of the spine where the lumbar region is too much convexed (forward) and the

pelvis inclined in proportion. It is caused by weakness of the muscles of the abdomen and front thigh, or by weakness of the extensors of the back. The chief aim of specialized exercise should be to strengthen the muscles of the abdomen and upper leg. If this is not achieved by the ordinary abdominal exercises (and movements in crook hang. and cr. ½ st. positions), the following movement may be applied: —

Str. Gr. Ly. Resist 2 L. Elev. — The pupil takes the stretch grasp lying position, and raises his legs as high as he can (Fig. 156), while the teacher makes a slight resistance against this movement by grasping the rising legs around the ankles with one hand and with the other exerting a gentle pressure on the abdomen. The teacher presses the legs back into commencing position, while the pupil makes a slight resistance. For weak pupils it is best not to resist the rising of the legs. The movement (which is repeated three or four times) brings into strong contraction the muscles of the abdomen and thigh.

As for such deformities as lateral curvature, we advise the teacher to leave them alone unless he has had special instruction in the application of medical gymnastics to such cases. *A child having lateral curvature or other serious deformity should not exercise in a class with healthy children*, but should be sent to the medico-gymnastic specialist for treatment; thus, a teacher will hardly have occasion to do anything in such cases.

RULES FOR MEASURING PUPILS.

ONE of the features of a modern gymnasium is the measuring of the pupils at the beginning and at the end of every working year, so as to observe what development each individual has gained; i.e., to measure the value of the methods

used in applying the exercises. To make such measurements on each pupil in a large school would be an absurd waste of useful time; for the human body during childhood yields so readily to slight impressions, and radical changes take place so fast, that the measurements can be of but little value in serving as *statistics* for the teacher to judge of his own work. Moreover, gymnastics in schools must be essentially class work, and the children will, as a rule, be grouped together according to age or size, and individualization can be done only to a very slight extent; hence the teacher could have but little use for the measurements towards supplying individual exercises. In gymnasiums where individual work is a distinctive feature — gymnasiums for grown persons — the conditions are a little different; for here the teacher is expected to give each pupil a separate set of exercises suited to his particular development (or lack of it); and to do so the teacher must measure each individual and make his prescriptions accordingly, the figures received at the beginning of the course telling what should be done, those at the end what has been done. Thus it will be seen that the figures are still for the teacher, — not for the pupil, — although he may show them to the pupil if he so desires.

The record of these measurements taken on grown persons should be kept by the teacher, so that, with these as a standard, he can make the necessary improvements in the system of gymnastics which he uses. Moreover, they will furnish coming scientists with the necessary statistics for their study of the evolution of man, etc.

Since man is himself the unit by which his development should be measured, some measure — usually the height — should be taken as a unit, and all the others compared to

this and recorded in fractions (percentage) thereof. This is the only way in which we can be able to judge concerning the harmony of the development; for we may now compare these figures to a standard table of measurements prepared by taking the average of a great number of measurements made on *well-proportioned* bodies. For ease of calculation and in conformity with progressive ideas, all measurements should be taken according to the metric system.

To measure every part of the body would be a waste of time; for, if a few of the important parts are measured, the figures will give a fair estimate of the general development. Parts to be measured are: —

1. *The height of the whole body.*

2. *The width of the chest*, taken on a level with the nipples, just in front of and close to the arms when they are hanging straight down.

3. *The depth of the chest*, taken on a level with the nipples, the arms of the caliper being on a level.

4. *The circumference of the chest*, also taken on a level with the nipples. Two measures are taken: one with the chest inflated, the other after exhalation. The tape-measure should be placed horizontally around the chest. These are the most valuable measurement, as they give us an approximate idea of the tidal volume of the one measured, and thus to some extent, indicate his power of survival. The tidal volume is the only "vital index" worth considering.

5. *The shoulder width*, taken outside the acromion, so that the caliper touches this bone.

6. *The waist.* — The circumference is measured in the narrowest place.

7. *The width of the hips.* — The pupil is in close st. pos.

while the measure is taken between the most protruding points of the hips — the greater trochanters of the femurs.

8. *The inside length of the leg* from the perineum to the ground, the feet being slightly apart and the body carried by both legs equally. On women, the outside length of the leg from the greater trochanter to the ground is taken instead. If the legs are of unequal length, a note is made of this.

9. *The length of each arm* from the acromion to the tip of the middle finger.

Furthermore, the pupil's weight and age are recorded.

(One transverse and one sagittal tracing taken by "the graphic method of anthopometry," together with the height measure and the two circumference measures of the chest, probably give a better estimate of the pupil than any other form of measuring.)

The record charts may conveniently be given the following appearance:

Name.	Age.		Weight.		Height.		The Chest.						Width of Shoulders.		Waist Circumference.		Width of Hips.		Inside / Outside length of Leg.				Outside length of Arms.				Remarks.
							Width.		Depth.		Circumference.								Right.		Left.		Right.		Left.		
											Inflated		After Exhalation.														
	Years.	Months.	First	Last	First	Last	First	Last	First	Last	First	Last	First	Last	First	Last	First	Last	First	Last	First	Last	First	Last	First	Last	
			Month.		Month.		Month.		Month.		Month.		Month.		Month.		Month.		Month.		Month.		Month.		Month.		

The following chart, extracted from a similar one published in a text-book on Anatomy by Prof. T. Hartelius (Stockholm, 1884), may serve as a standard for comparison. The figures represent an average of numerous measurements taken by Prof. Carl Curman on living models and on antique statuary.[1]

AVERAGE PHYSICAL DEVELOPMENT, WHEN THE BODY IS COMPARED TO ITSELF.	HEIGHT = 100.			
	Man.	Woman	Child.	
	25 years old.		About 5 years old.	About 1 year old.
Height of the head above the chin (measured from the top of the skull to under the chin)	13.6	14.0	19.0	22.5
Height of the head above the top of the sternum (from the top of the skull)	17.5	17.6	21 5	25.5
Height of the head above the acromion	17.7	18.2	21.0	25.0
Height of the head above the inferior end of the sternum,	27.5	28.5	31.5	36.5
Height of the head above the crest of the ilium	41.5	42.5	47.5	53.0
Height of the acromion above the greater trochanter	30.0	30.0	32.0	33 5
Length of the arm from acromion to tip of middle finger	45.5	44.0	42.0	41.5
Length of the arm from acromion to the middle of the elbow	20.0	19.0	18.0	18.0
Length of the forearm from the elbow to the middle of the wrist	14.5	14.0	12.5	12.0
Length of the leg from the ground to the crest of the ilium	58.5	58.0	53.0	46 5
Length of the leg from the ground to the perineum	47.5	-	40.0	35.0
Length of the leg from the ground to the middle of the patella	28.5	28.0	26.5	24.0
Height of the foot from the ground to the inside malleolus,	5.0	5.0	5.0	5.2
Height of the foot from the ground to the outside malleolus,	4.0	4.0	4.2	4.5
Length of the foot from the heel to the tip of the big toe,	15.5	15.0	15.8	15.2
The width of the head between the parietal eminences	9.0	9.2	13.0	18.0
The depth of the head from the forehead to the occiput	11.5	11.8	17.0	22.0
Diameter of the neck	6.5	6.5	-	-
Shoulder width from acromion to acromion	23.0	21.5	22.0	25.0
Width of the chest (on a level with the nipples)	17.5	16.0	17.0	21.0
Depth of the chest (on a level with the nipples)	10.5	10.0	12.0	16.0
Width of the hips (over the greater trochanters)	19.5	21.0	18.0	23.0
Width of the thigh at the middle	8.3	8.7	-	-
Width of the leg at the middle of the calf	7.0	6.8	-	-
Width of the foot across the metatarsal-phalangeal articulations	5.7	5.3	5.5	6.5
Width of the arm across the middle of biceps	5.4	5.0	-	-
Width of the forearm across its thickest part	5.9	5.5	-	-
Width of the hand across the metacarpal-phalangeal articulations	5 0	4.5	5.0	6.0

[1] This chart gives the average of well-proportioned men and women, not of the homely "typical man."

PREPARATORY SWIMMING EXERCISES.

SWIMMING is an accomplishment that every one should possess, not only because some day one may save his own life or that of another, if he be a skilled swimmer, but also because the art is worth learning for the sake of the exercise itself, which is undoubtedly one of the best for the promotion of physical development. In the summer, the heat usually prevents gymnastic exercises from being practised to any great extent, while swimming will furnish both exercise and recreation, without adding the discomfort of excessive heat. To know how to keep one's self afloat, one need only be familiar with the movements which constitute swimming, and have consciousness of their efficacy.

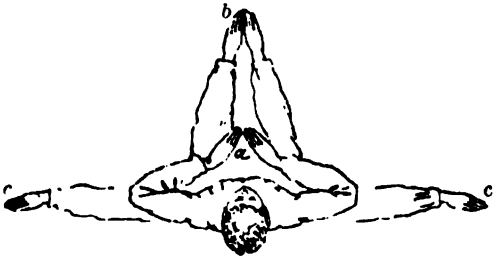


FIG. 265.—2 A. SWIM.

Consequently, the best plan for acquiring the art is to learn the swimming movements on *terra firma* so thoroughly that we do them unconsciously when we go into the water; and children may be most easily given this practice if the swimming movements are brought in as part of educational gymnastics.

The exercises are described in accordance with the plan followed in "*Gymnastiska Dagöfningar*," by C. H. Liedbeck,[1] from which handbook they are borrowed.

St. Introd. to 2. A. Swim. w. even Counts (Fig. 265).— Command, "*Arms forward — bend! Arm swim — one! Two!*

[1] The grandson of P. H. Ling and instructor of Medical Gymnastics in the Roy. Gymn. Centr. Inst.

Three!" . . . 1. The hands are brought so far forward that the fingers touch, the palms facing slightly outward. 2. The arms are stretched forward, the hands still touching and facing as before. 3. The straight arms are moved sideways into yd. *c* pos., while the palms of the hands are turned backward. The arms are horizontal throug out the movement.

Stoop St. Introd. to 2 A. Swim. w. even Counts. — The exercise is done as the previous one, the arms being horizontal throughout the movement.

Stoop St. Introd. to 2 A. Swim. w. uneven Counts. — This is done in a like manner, except that the rhythm is changed, the first two motions being done quickly, and immediately following each other, the third motion being slow. The command is, . . . "*Arm swim — one two! Three!*" . . . These exercises may be used as shoulder-blade-movements.

FIG. 266. — HANG. INTROD. TO 2 L. SWIM. *a*, "ONE!" *b*, "TWO!" *c*, "THREE!"

Lying Introd. to 2 L. Swim. w. even Counts (compare Fig. 266). — The pupil is lying face up on a bench with neck firm. Command, "*Leg swim — one! Two! Three!*" . . . 1. With heels held together, the pupil draws his legs up as far as he can, knees and hips bending, and the feet bent upward. 2. Separating the feet, and extending the insteps, the pupil stretches

his legs sideways into stride pos. 3. The straight legs are brought together into commencing position.

Lying Introd. to 2 L. Swim. w. uneven Counts. — This is as just described, except that the rhythm is changed, the command being, . . . "*one ⁀two! Three!*" . . .

These movements may be used as abdominal exercises. They may also be done in hanging position (Fig. 266) (under hang. or over gr. hang), and are then easy heaving-movements. They may also be done in forward lying position, the pupil grasping the stall-bars, or his hands being held by another pupil.

Str. Forw. Lying Pos. (Fig. 267). — The pupil is lying face down on the floor (on a piece of carpet used for the occasion, or lengthwise on a bench). Command, "*In position — one! Two!*" . . . 1. The pupil swings his arms up into str. pos., and arches his body so that the feet leave the floor. 2. He resumes commencing position. At first the position may be taken with hips firm instead of arms upward stretch, so as to teach the pupil how to arch the body. The movement is a shoulder-blade movement.

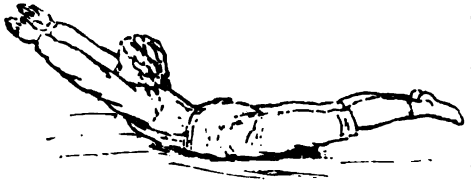


FIG. 267. — STR. FORW. LYING POS.

Forw. Ly. 2 A. and L. Swim. — The pupil is lying across a bench (covered by a cushion, if one is at hand). Command, "*Arm and leg swim — one ⁀two! Three!*" . . . The movements of the arms and legs are combined and executed on the same principles as above. The exercise is very exhausting, and can be practised only for a few moments at a time; for instance, three or four strokes are done, and then follows a short rest before the movement is repeated.

The progression of these exercises is as follows: —

1. St. Introd. to 2 A. Swim. w. even counts.
2. Ly. Introd. to 2 L. Swim. w. even counts.
3. Str. Forw. Ly. Pos.
4. Stoop St. Introd. to 2 A. Swim. w. even counts.
5. Stoop St. Introd. to 2 A. Swim. w. uneven counts.
6. Ly. Introd. to 2 L. Swim. w. uneven counts.
7. Forw. Ly. 2 A. and L. Swim.

These exercises are best practised in connection with gymnastics, just before the bathing season commences. The movements may then be arranged to occupy two weeks of daily practice, and may be applied according to the following chart (by Liedbeck): —

Number of day . . .	1, 2, 3.	4.	5.	6.	7, 8.	9.	10, 11, 12.
Number of exercise .	1, 2, 3.	1, 2, 3, 4.	2, 3, 4.	2, 3, 4, 5.	3, 5, 6.	5, 6, 7.	7.

The number of exercise refers to the progressive list just given.

After the swimming movements have been practised thus, swimming may be safely tried in shallow water, with the aid of a girdle held by the teacher, or by some other method, the description of which does not belong here.

PHYSIOLOGICAL EFFECTS OF EXERCISE.

On the Lungs. — Every muscular exertion is involuntarily preceded by an increased inhalation, Nature thus providing an increased supply of oxygen to substitute that which is used up by the muscular contraction; in other words, exercise induces respiration; and, proportionately to the force used in the exertion, it also accelerates the respiratory act. In consequence of this, the pulmonary circulation becomes accelerated, and the

quantity of air inhaled and of carbon dioxide exhaled is greatly increased. The elimination of water through the lungs also increases in proportion to the exertion.

Dr. Edward Smith's experiments ("Parkes' Practical Hygiene") are interesting. He found that if the quantity of air inhaled in the lying position was taken as unit, that inhaled in sitting position was 1.18; in standing position, 1.33; walking 1 mile an hour, 1.90; walking 4 miles an hour, 5.00; and walking 6 miles an hour, 7.00, etc. Or, in other words, if a man at rest inhales 480 cubic inches of air per minute, while walking 4 miles an hour he inhales 2,400 cubic inches, and while running 6 miles an hour 3,360 cubic inches. The carbon dioxide exhaled is increased in proportion.

Both the active muscle and the one at rest absorb oxygen and give off carbon dioxide, the absorption of oxygen and exhalation of carbon dioxide in the contracting muscle being about twice as great as in the resting one (Beclard, Helmholz, etc.). If the carbon dioxide were not rapidly carried off by the blood and eliminated from the body, the muscles would soon become unable to work. For it has been proved that, if the pulmonary circulation and the exhalation of carbon dioxide are impeded, muscular exertion soon becomes impossible. Thus, to insure proper elimination of carbon dioxide from the body, it is necessary that muscular exercise take place; and when it cannot, the supply of carbon (carboniferous food) must be lessened, if the body is to remain healthy.

Although respiration under ordinary circumstances is an entirely mechanical action, yet it may be controlled by the will, and the latter also governs the respiration unconsciously, since every act of volition will cause it to be hastened. This is true whether the effort be physical or psychical. Respira-

tion is also influenced by temperature, the respiratory act becoming deeper in the same degree as the body loses heat; and, reversely, the temperature of the body will rise as respiration becomes deeper (prolonged respiratory exercises, etc.).

Since oxygen is one of the chief power-producing elements in the body, it can be said that to be strong — capable of much work — good breathing capacity is of greater value than muscular strength; for the former gives one the quality of endurance or ability to persevere, which is the key-note to success in the struggle for the survival of the fittest.

Whereas properly guided exercise will strengthen and develop the breathing apparatus, lack of exercise will weaken the lungs, and may even lead to tuberculosis and allied diseases. On the other hand, excessive exercise may cause pulmonary congestion and even hemorrhage from the lungs.

From these facts we gather the following rules to be observed during exercise: —

(1.) The respiratory organs must be allowed perfect freedom of motion: no tight clothing (corsets!) should be used; and any exercise which compresses the chest or interferes with free respiration is to be avoided.

(2.) Since the elimination of carbon dioxide and the need of oxygen are so much increased, the air should be as pure as possible. Hence, exercise out-of-doors is the best; but if it has to be taken in-doors, the room should be well ventilated and as far as possible kept free from dust.

(3.) The exercises should be so arranged as not to cause over-exertion, since the latter produces pulmonary congestion (a condition manifesting itself by deep sighing). Hence, when the exercise causes laborious breathing, rest should take place, or, still better, such movements should be immediately

used as will remove this condition (respiratory exercises; slow leg-movements).

(4.) Since the elimination of carbon is so much increased, those who exercise should partake of more carboniferous food — best given in the form of fat.

While on the one hand it may be said that free respiration is the basis of exercise, on the other it is possible by special exercises to increase the possibility as well as the ability of respiration.

On the Blood and Circulatory Organs. — The increase of color and quickening of the pulse show us that exercise accelerates the circulation.

When a muscle contracts, it exerts a pressure on those vessels which are located in or around it. The arteries have firm and hard walls, and the blood within them flows forward with considerable pressure; furthermore, the semi-lunar valves at the opening of the aorta prevent the arterial current from taking a backward direction: hence the arteries are but little affected by the pressure of the active muscle. The veins have less elastic walls, and the pressure of the blood in them is less. Their valves preventing the current from flowing in the opposite direction, it follows that the muscular pressure drives the venous current toward the heart with increased speed. At the same time, the *vis a tergo* in the arterial current increases. When the contraction ceases, the veins in question contain less blood. This produces a suction in these vessels, which force, added to the pressure from the arterial side, causes a new supply of blood to rush in with accelerated speed, this being repeated at every contraction and relaxation. At the same time the absorption of oxygen in the contracting part causes the arterial current to flow more quickly to it, in order

to supply the waste: the *vis a fronte* of the arterial current increases. In fact, active contraction has even more effect on the local afflux than on the return current from the same part.

During flexion and extension, the vessels become alternately shortened and lengthened. Moderately extended, the vessels hold more blood than they do when shortened; hence bodily movements act upon the circulation much after the manner of a force-pump: the flow toward the heart is accelerated, and the *vis a tergo* of the blood increased.

Through the action of centrifugal force, the blood becomes driven into the peripheral ends of quickly moving parts, as, for instance, into shoulders and chest in quick T. sidew. flex., into the hands in yd. c stride st. quick T. rot., etc.

Respiration also affects the circulation, as will be seen from the following: At inspiration the elastic air-cells resist the pressure from the inhaled air, and this causes the pressure on other organs (heart and large vessels) within the chest to be less than one atmosphere ("negative pressure"); a suction is caused in direction of the lungs. The blood in the veins is drawn forward to fill the vacuum. The arteries become but little affected, on account of their stiff walls and of the pressure of the blood in them. Besides, the closing of the semi-lunar valves during the diastole of the ventricles prevents any backward direction of the arterial current. This suction, which by deep inhalations becomes four or five times greater than what it is during ordinary inhalations (Wundt), is a powerful aid in the propulsion of the venous currents. Expiration has the opposite effect: it accelerates the arterial currents, but retards the venous ones.

Every active movement increases the action of the heart, which usually has from ten to thirty more beats per minute

during exercise, and sometimes a great deal more. After exercise the heart's action usually falls below the normal — after severe exercise, even as low as fifty to forty per minute. But if due attention is paid to the freedom and extension of the respiratory act, the heart's action need not deviate much from the normal. The same is true, if certain movements are used that will furnish mechanical aid for the propulsion of the blood; i.e., lessen the work for the heart.

Excessive as well as deficient exercise will weaken the heart, and cause diseases, such as palpitation, hypertrophy, dilatation, fatty degeneration, etc. On the other hand, properly guided exercises will tend to strengthen a weakened heart; and in such cases it would be a mistake not to make use of exercise as a therapeutic agent, as well as to suppose that absolute rest is beneficial.

Exercise has also a great influence on the quality of the blood; for, by the increased pressure, the phenomena of endosmosis and exosmosis become livelier, and the absorption of vital constituents becomes more rapid. At the same time, the blood more quickly carries away the waste matter, and throws it off through the organs of excretion; and in this manner its own quality improves.

On the Digestive Organs. — At every inspiration the diaphragm flattens, and exerts a pressure on the contents of the abdomen, the walls of which rise. At expiration the diaphragm rises, and the walls of the abdomen again sink. Thus the diaphragm and the air above it act like a pump, causing a constant oscillation of the abdominal and pelvic contents, increasing the action of their involuntary muscles. This motion aids the peristaltic movements of the stomach and intestine in carrying the food downward, and in hastening the process of digestion.

It is well known how exercise increases the appetite, especially for meat and fat. This increase of appetite indicates a more perfect digestion, and a more rapid absorption. On the other hand, lack of exercise lessens the appetite as well as the power of digestion. During exercise, the circulation through the liver is very much accelerated, especially by flexion of the trunk in one direction or another, which movement, by accelerating the circulation through the inferior vena cava, causes a suction in the veins which feed it. Besides, the pressure in the mesenteric veins rises, increasing the afflux to the portal vein. Similar effects are produced by deep inspirations.

Finally, if the voluntary muscles of the abdomen are well developed, a livelier peristalsis is insured, and the fæces are more readily expelled. Thus exercise, whether general or special, will improve and maintain the normal functional activity of the digestive organs.

While it may be well not to exercise immediately after a heavy meal, experiments seem to prove that exercise after a moderate meal does not retard digestion. Exercise on an empty stomach should be attempted only by strong individuals.

On Absorption. — By the increased pressure of the blood, the phenomena of endosmosis and exosmosis become very much livelier, and the flow of the lymph accelerated.

The lymph-vessels are provided with valves like those of the veins — opening toward the heart; hence the alternate contraction and relaxation of adjacent muscles will have the same effect upon the lymphatics as upon the veins: that of forcing the contents of the vessels forward in direction of the heart.

Inhalation has the same effect upon the thoracic duct as

upon other vessels in the thoracic cavity; a suction is caused in it which accelerates the flow of its contents. At exhalation, the thoracic duct becomes compressed, and its contents are forced into the venous circulation.

On the Skin. — The cutaneous circulation is accelerated, the skin grows red, and perspiration increases. The amount of evaporating fluid is double (or more) what it is during rest; water, chloride of sodium, acids, and some nitrogen are eliminated. This evaporation lessens the temperature of the body, and prevents it from becoming excessively high. If the pores are closed by dirt, or if there be anything else to check the evaporation, the bodily heat soon rises; the work of the lungs in the elimination of water is greatly increased; breathing becomes laborious, and the power of continuing the exercise rapidly decreases.

After *exertion*, the temperature of the body falls quickly below the normal degree, while the skin evaporation still continues; hence, danger of taking cold arises.

From this it follows: —

(1.) That the skin should be kept clean.

(2.) That the exercise should be taken in a cool room (55° to 60° F.).

(3.) That, during exercise, the clothing worn should be light.

(4.) That, after exercise, thicker clothing should be put on to prevent chill.

On the Kidneys. — On account of the increased skin evaporation, not only the water of the urine, but also the chloride of sodium, is lessened. The amount of urea usually remains about the same, although oftentimes it decreases — probably on account of the greater excretion of nitrogen through the lungs (Draper, Regnault, Reiset). Dr. John C. Draper's experiments

demonstrate that "after violent exercise, the total amounts of solid residue and urea are diminished, while the proportion of urea to solid residue remains about the same."

On the other hand, by lessening the activity of the skin and lungs, lack of exercise forces the kidneys to increase their excretory function, and may be a contributing cause to various disorders of these organs.

On the Organs of Locomotion. — In active muscles, the temperature increases in proportion to the work (up to a certain limit); there is a change from neutral to alkaline reaction, the principal metamorphoses being the oxidation of the hydrocarbons and the formation of free acid. The venous current from the muscle carries darker blood, less rich in oxygen and water and richer in carbon oxide.

As a result of these changes, the muscles, through regularly taken exercise, grow larger, heavier, and richer in nitrogen; and as the muscles grow, so do the bones and other passive organs of locomotion. On the other hand, unused muscles diminish in size and strength, and may finally entirely cease to respond to cerebral influence. At the same time, too much exercise of a muscle will cause it to decrease in size and power after it has reached a certain degree of development. This, however, does not occur when all the muscles are moderately exercised, and sufficient time is allowed for rest. If the food does not contain a sufficient amount of nitrogen, other parts of the body have to furnish the supply to the active muscles; and in such a case it is usually the heart that suffers most.

The exhaustion of the oxygen supply and the accumulation of acids in the active muscles soon produce fatigue. In order that the waste may be carried off and a new supply of oxygen stored up, the tired muscle must have a shorter or longer period

of rest before contraction can again take place. This alternation between activity and rest occurs even during exercise, although the period of rest at such times is usually insufficient to allow the muscle fully to recuperate. Yet, by letting gymnastic movements follow each other according to physiological principles, the immediate effect of a short period of exercise can be made to be a sense of rest and invigoration instead of fatigue and exhaustion. This, however, cannot be done when the exercise is prolonged or when it is of a one-sided nature. The general oxygen hunger manifests itself in languor and desire to sleep. Before work can be resumed, all the muscles (and nerves) under the control of the will must be allowed absolute rest until a sufficient amount of oxygen has again been stored up. Artificial means (massage, stimulants, etc.) may occasionally serve instead of rest, but cannot be relied upon as permanent substitutes.

From these facts it follows: —

(1) That there is a limit to physical development; and hence that the chief aim of exercise should not be great muscular development, but health.

(2) That this limit is reached sooner, if the exercise is of a one-sided character.

(3) That during periods of exercise, the food should contain more nitrogen.

(4) That, if good physical development is to be acquired, the exercise should include the whole body, and should alternate with periods of sufficient rest.

On the Nervous System. — Experience has proved that inactive motor nerves grow weaker, become fattily degenerated, and finally lose all irritability, so that it becomes impossible even to think in the direction of movements to which those

nerves should give the impulse. At the same time the sensory nerves become highly sensitive and even morbidly irritable. The nervously unstrung are to be sought among brain-workers of sedentary habits, — not among laborers or persons leading an active out-of-door life.

In all active exercise, the cerebral influence to the acting parts is highly increased; and it may be said that the nerves in question are even more active than the muscles which they move. The consequence of this is, that the nutritive results of muscular contractions are taken up by the nerves still more than by the muscles. Thus exercise becomes efficient in strengthening and developing the nervous system, and in maintaining it in normal condition. In fact, exercise may often serve as a valuable remedial agent in nervous disorders.

It is to be remembered, however, that while moderate exercise increases the size and number of fibrils in the axis cylinders, recuperation after nervous exhaustion occurs much more slowly than after muscular exhaustion, and, hence, that over-exercise of nerves will be far more pernicious than that of muscles.

On the Mind. — As the general circulation and the quality of the blood improve, the brain becomes better nourished, and its power of action increases; so that it is only in a healthy body that we can find a healthy mind; whereas, if the body is weakened by disease, — by inactivity, — the intellectual powers become enfeebled.

Many maintain that it is not possible to combine great mental work with powerful bodily exercise, but practical experiments have proved this to be an entirely mistaken idea; for, if the two are made judiciously to alternate, it will be found that the results of each become much more extensive,

much better in quality. If athletes are stupid, it is because they make no efforts toward mental cultivation, and not because exercise lessens their powers in this direction.

But besides its general effects on the mind, exercise can be made to have quite special ones, as mentioned in other parts of this book, so that systematic physical training becomes quite an important factor in education. For by exercise it is possible to train the attention for inhibition and association with, in some respects, much more definite results than are obtained by theoretical study.

The moral forces are also affected by exercise, for immorality goes hand in hand with morbidity of mind. If the latter can be changed, the former will also improve. It is the weak, and not those who are strong in body and mind, that recruit the jails.

Exercise develops a consciousness of power, which inspires courage, confidence, and resolution. Through its influence the moral self comes forth healthier, purer, and stronger, and man becomes in every way better fitted to lead a life of usefulness to his fellow-men.

MEMORANDA OF THE MUSCULAR ACTIVITY IN THE PRINCIPAL MOVEMENTS OF THE HUMAN BODY

MEMORANDA OF THE MUSCULAR ACTIVITY IN THE PRINCIPAL MOVEMENTS OF THE HUMAN BODY.

THE HEAD AND NECK.

MOVEMENT.	MUSCLE.	ORIGIN.	INSERTION.
Forward flexion.	PLATYSMA MYOIDES.	Clavicle. Acromion. Fascia of { Pectoral, Deltoid, Trapezius.	Lower jaw. Angle of the mouth. Cellular tissue of the face.
	STERNO-CLEIDO-MASTOID.	Sternum. Inner third of clavicle.	Mastoid process of temporal bone. Superior curved line of occipital bone.
	LONGUS CAPITIS.	Anterior tubercles, transverse processes of 3d to 6th cervical vertebræ.	Basilar process of occipital bone.
	Rectus Capitis Anticus (Minor.)	Transverse process of atlas.	Basilar process of occipital bone.
	Longus Colli.	Anterior tubercles, transverse processes of 3d, 4th, 5th, and 6th cervical vertebræ. Bodies of first 3 dorsal vertebræ. Bodies of lower 3 cervical and upper 3 dorsal vertebræ.	Tubercle, anterior arch of atlas. Transverse processes, 5th and 6th cervical vertebræ. Bodies of 2d, 3d, and 4th cervical vertebræ.
	[Scalenus (*a*. Anticus, *b*. Medius, *c*. Posticus).]	*a*, *b*. Upper surface of 1st rib. *c*. Outer surface of 2d rib.	*a*. Transv. proc., 3d to 6th cervic. verteb. *b*. Transv. proc., all cervic. verteb. *c*. Posterior tubercle, transverse processes, lower three cervical vertebræ.
	(Digastric.)	Digastric fossa of temporal bone. Symphysis of inferior maxillary.	Body and great cornu of hyoid bone.
	(Sterno-hyoid.)	Posterior surface of sternum. Sternal end of clavicle.	Body of hyoid bone.
	(Sterno-thyroid.)	Posterior surface of sternum. Cartilage of 1st rib.	Oblique line of thyroid cartilage.

	(Omo-hyoid.)	Upper border of scapula. Transverse scapular ligament.	Body of hyoid bone.
	(Mylo-hyoid.)	Mylo-hyoid ridge of lower jaw.	Body of hyoid bone.
	(Genio-hyoid.)	Genial tubercle of inferior maxillary.	Body of hyoid bone. Side of pharynx. Whole inferior surface of the tongue.
Backward flexion.	TRAPEZIUS.	Occipital bone, inner third of superior curved line. Ligamentum nuchæ. Spinous processes of last cervical and all dorsal vertebræ. Supra-spinous ligament.	Posterior border of clavicle, outer third. Acromion, superior margin. Spine of scapula, superior border.
	(Levator Anguli Scapulæ.)	4 upper cervical vertebræ, transverse proc.	Scapula, posterior border.
	SPLENIUS.	Ligamentum nuchæ, lower half. Last cervical and 6 upper dorsal spinous processes.	Mastoid process. Occipital bone, outer third of superior curved line. 3 or 4 upper cervic. verteb., transv. proc.
	(Ilio-costalis cervicis.)	Angles of 4 or 5 upper ribs.	4th, 5th, and 6th cervic. verteb., transv. proc.
	(Longissimus cervicis.)	1st to 6th dorsal vertebræ, transverse processes.	2d to 6th cervical verteb., transv. proc.
	LONGISSIMUS CAPITIS.	3d, 4th, 5th, and 6th dorsal vertebræ, transverse processes. lower 3 or 4 cervic. verteb., articular proc.	Mastoid process, posterior margin.
	SPINALIS CERVICIS.	5th to 7th cervic. verteb., spinous processes. (1st and 2d dorsal verteb., spinous processes.)	Spine of axis. (Spines of 3d and 4th cervical vertebræ.)
	SEMIPINALIS CAPITIS.	Last cervical and 3 upper dorsal vertebræ, transverse processes. 4th, 5th, and 6th cervic. verteb., articular proc.	Occipital bone, between the curved lines Occipital protruberance.
	MULTIFIDUS SPINÆ.	Back of sacrum. Ilium, posterior superior spine. Posterior sacro-iliac ligaments. *Cervical vertebræ, articular processes.* Lumbar and dorsal vertebr., transv. proc.	Inferior border and lateral surface of the transverse processes of all true vertebræ, except the first one.
	Inter-spinales.	Between spinous processes, 6 pairs in cervical, 3 in dorsal, and 4 to 6 in lumbar region.	

MOVEMENT.	MUSCLE.	ORIGIN.	INSERTION.
Backward flexion.	Rectus Capitis Posticus Minor.	Posterior tubercle of atlas.	Occipital bone, inner third of inferior curved line.
	Obliquus Capitis Superior.	Transverse process of atlas.	Occipital bone, between the curved lines.
Sideways flexion.	Plat. Myoides, Sternocleido-mastoid. Trapezius, Splenius, LONGISSIMUS CAPITIS, Semi-spinalis Capitis, SCALENI, LEVATOR ANGULI SCAPULÆ.	See above.	See above.
	Rectus Capitis Posticus Major.	Spine of axis.	Occiput, middle third of inferior curved line.
	Inter-transversales.	Between transverse processes of all true ver-	tebræ, except last lumbar.
	Rectus Lateralis.	Transverse process of atlas, upper surface.	Occipital bone, jugular process.
Rotation.	Semi-spinalis Capitis, Multifidus Spinæ, Ilio-costalis cervicis, SPLENIUS, Longissimus Capitis, STERNO-MASTOID, TRAPEZIUS.	See above.	See above.
	Obliquus Capitis Inferior.	Spinous process of axis.	Transverse process of atlas.

THE TRUNK.

MOVEMENT.	MUSCLE.	ORIGIN.	INSERTION.
Forward flexion.	RECTUS ABDOMINIS.	Pubic crest. Symphysis pubis.	Cartilage of 5th, 6th, and 7th ribs. Ensiform appendix.
	Pyramidalis.	Front of pubic bone. Anterior pubic ligament.	Linea alba, half-way to umbilicus.
	EXTERNAL OBLIQUE.	Digitations from 8 lower ribs.	Crest of ilium, anterior outer lip. Linea alba. Ensiform cartilage. Symphysis and crista pubis. Pectineal line.

	(Internal Oblique.)	Lumbar fascia. Crest of ilium, anterior two-thirds of middle lip. Poupart's ligament, outer half.	Cartilages of 6 lower ribs. Linea alba, by aponeurosis. Pubic crest, Pectineal line, } by tendon of transversalis.
	PSOAS MAGNUS.	Bodies and transverse process of last dorsal and all lumbar vertebræ.	Femur, lesser trochanter.
	Iliacus.	Iliac fossa to inferior spine; Sacrum.	Oblique line below Lesser trochanter.
Forward downward flexion.	*The above muscles, assisted by* Pectoralis Major,	Clavicle, sternal one-half. Front of sternum, down to the 6th or 7th rib. Cartilages of all true ribs. External oblique.	Humerus, bicipital ridge.
	Pectoralis Minor,	3d, 4th, and 5th ribs. Intercostal aponeurosis.	Coracoid process of scapula.
	(Serratus Magnus),	9 digitations from 8 upper ribs (2 on the 2d). Intercostal aponeurosis.	Inner margin, posterior border of scapula.
	(Transversalis),	Poupart's ligament, outer one-third. Crest of ilium, anterior two-thirds of inner lip. Cartilages of 6 lower ribs. Aponeurosis from spinous and transverse processes of lumbar vertebræ.	Linea alba. With internal oblique into pubic crest and pectineal line.
	(Pectineus),	Ilio-pectineal line and crista pubis. Gimbernat's ligament.	Femur, between trochanter minor and linea aspera.
	Adductor Longus,	Front of pubes.	Linea aspera, middle third.
	Adductor Brevis,	Descending ramus of pubes.	Linea aspera, upper third.
	RECTUS FEMORIS,	Ilium, anterior, inferior spine. Groove above the brim of acetabulum.	Over patella into tuberosity of tibia.
	SARTORIUS.	Ilium, anterior, superior spine. Iliac notch, superior one-half.	Upper inner surface, shaft of tibia, near the crest.
Backward flexion.	Trapezius.	See above.	See above.
	Rhomboideus.	Ligamentum nuchæ. Spines of last cervic. and first 4 dorsal verteb. Supra-spinous ligament.	Vertebral border of scapula.

MOVEMENT.	MUSCLE.	ORIGIN.	INSERTION.
Backward flexion.	(Latissimus Dorsi.)	Aponeurosis from sacral, lumbar, and 5 lower dorsal vertebræ. Crest of ilium, posterior one-fourth. Digitations from the 3 or 4 lower ribs.	Humerus, bicipital groove.
	(Serratus Posticus Superior.)	Ligamentum nuchæ. Spines of last cervical and 2 upper dorsal vert.	4 digitations into upper outer border of 2d to 5th ribs inclusive.
	(Serratus Posticus Inferior.)	Spines of last 2 dorsal and first 3 lumbar verteb.	4 digitations into lower border of the 4 lower ribs.
	ERECTOR SPINÆ.	Sacro-iliac groove. Sacral, lumbar, and 3 lower dorsal spines. Iliac crest. Posterior eminences of sacrum.	The next two muscles.
	ILIO-COSTALIS LUMBORUM.	Erector spinæ.	Angles of 6 lower ribs.
	LONGISSIMUS DORSI.	Erector spinæ.	Transverse processes of lumbar vertebræ. Transverse processes of all dorsal vertebræ. Between tubercles and angles of 7th to 11th ribs.
	Spinalis Dorsi.	Spines of last 2 dorsal and first 2 lumbar vertebræ.	Spines of 2d to 8th dorsal vertebræ.
	Semispinalis Dorsi.	Digitations from transverse processes of 6 lower dorsal vertebræ.	Spines of upper 4 dorsal and lower 2 cervical vertebræ.
	Multifidus Spinæ.	See above.	See above.
	QUADRATUS LUMBORUM.	Ilio-lumbar ligament. Posterior portion of inner crest of ilium.	Transverse processes of 4 upper lumbar vertebræ. Lower border of 12th rib, posterior one-half.
	Levatores Costarum.	Transverse process of a dorsal vertebra.	Next rib below, upper surface near the angle.
Sideways flexion.	External Oblique, INTERNAL OBLIQUE, QUADRATUS LUMBORUM, Longissimus Dorsi, ILIO-COSTALIS LUMBORUM.	See above.	See above.

Rotation.	Int. oblique, TRANSVERSALIS, Latiss. dorsi, Serratus post. inf., ILIO-COSTALIS LUMBORUM, Trapezius, and internal rotators of the thigh of the same side; the ext. oblique and ext. rotators of the thigh of the opposite side.

SHOULDER-BLADE.

MOVEMENT.	MUSCLE.	ORIGIN.	INSERTION.
Drawn backward and downward.	Latissimus Dorsi, Rhomboideus; TRAPEZIUS (inferior portion).	See above.	
Drawn forward and downward.	Serratus Magnus. PECTORALIS MINOR. Coraco-brachialis.	See above.	
Elevation.	LEVATOR ANGULI SCAPULÆ. Trapezius (superior portion).	See above.	
Depression.	Trapezius (inferior portion). Pectoralis Minor. Latissimus Dorsi. Pectoralis Major.	See above.	

ARM.

MOVEMENT.	MUSCLE.	ORIGIN.	INSERTION.
Elevation sideways to horizontal position.	DELTOID (middle portion).	Clavicle, outer one-third. Acromion, outer margin and upper surface. Spine of scapula, lower border.	Shaft of humerus, outer surface near its middle.
	Supraspinatus.	Supra-spinous fossa, inner two-thirds.	Greater tuberosity of humerus, superior facet.

MOVEMENT.	MUSCLE.	ORIGIN.	INSERTION.
Sideways from horizontal to vertical position.	(Serratus Magnus.) TRAPEZIUS.	See above.	
Elevation forward, upward.	Deltoid (anterior portion). Pectoralis Major.	See above.	
	CORACO-BRACHIALIS.	Apex of coracoid process.	Inner side of the shaft of humerus, near its middle.
	Biceps (long head).	Upper margin of glenoid cavity.	Tuberosity of radius. Fascia of forearm.
Elevation backward.	DELTOID (posterior portion).	See above.	
	Triceps (long head).	Depression below the glenoid cavity of scapula.	Upper end of olecranon process.
	Latissimus Dorsi.	See above.	
Depression from horizontal position.	Pectoralis Major; Latissimus Dorsi; Teres Major.	Inferior angle of scapula.	Bicipital ridge of humerus. Greater tuberosity of humerus, lower facet.
	Teres Minor. Subscapularis.	Axillary border of scapula, upper two-thirds. Sub-scapular fossa, inner two-thirds.	Lesser tuberosity of humerus.
Rotation inward.	Anterior portion of Deltoid; Subscapularis, Pectoralis Major.		
Rotation outward.	Posterior portion of Deltoid; Supraspinatus, Teres Minor, Coraco-brachialis.	See above.	
	Infraspinatus.	Infra-spinous fossa, inner two-thirds.	Greater tuberosity of humerus, middle facet.

FORE-ARM.

MOVEMENT.	MUSCLE.	ORIGIN.	INSERTION.
Flexion.	BICEPS.	Upper margin of glenoid cavity. Apex of coracoid process.	Tuberosity of radius. Fascia of forearm.
	BRACHIALIS ANTICUS.	Lower half of the shaft of humerus, anterior lateral aspect.	Coronoid process of ulna.
	Pronator Teres.	Above inner condyle of humerus. Lower portion of inter-muscular septum. Inner side of coronoid process of ulna.	Shaft of radius, outer side near its middle.
	SUPINATOR LONGUS.	External condyloid ridge of humerus, upper two-thirds. Intermuscular septum.	Styloid process of radius.
	Flexor Carpi Radialis.	Inner condyle. Intermuscular septum.	Base of 2d metacarpal bone.
	Palmaris Longus.	Same as Flexor Carpi Radialis.	Annular ligament. Palmar fascia.
	Flexor Carpi Ulnaris.	*a.* Inner condyle. *b.* Inner margin of olecranon. Upper two-thirds, posterior border of ulna. Intermuscular septum.	Pisiform bone. Annular ligament. Base of 5th metacarpal bone.
	Flexor Sublimus Digitorum.	*a.* Inner condyle. Internal lateral ligament. Intermuscular septum. *b.* Inner side of coronoid process. *c.* Oblique line of radius.	4 tendons into lateral margins of the second phalanges.
Extension.	Triceps.	*a, b.* Posterior surface, shaft of humerus above and below the musculo-spinal groove. *c.* Depression below the glefoid cavity of scapula.	Upper end of olecranon process.
	Subanconeus.	Humerus, above olecranon fossa.	Posterior ligament of elbow-joint.

MOVEMENT.	MUSCLE.	ORIGIN.	INSERTION.
Pronation.	Pronator Teres, Flexor Carp. Rad., Palm. Long., Flex. Subl. Digit.	See above.	
	Pronator Quadratus.	Oblique line, lower one-fourth of ulna. Internal border of ulna.	Shaft of radius, lower one-fourth, anterior surface and external border.
Supination.	Biceps.	See above.	
	Supinator Brevis.	External condyle of humerus. External lateral and orbicular ligaments. Oblique line of ulna.	Anterior superior surface of radius.
	Extensor Secundi Internodii Pollicis.	Posterior surface, shaft of ulna. Interosseous membrane.	Base of last phalanx of the thumb.

HAND.

MOVEMENT.	MUSCLE.	ORIGIN.	INSERTION.
Flexion.	FLEXOR CARPI RADIALIS and Ulnaris, Palmaris Longus, Flex. Subl. Digitorum.	See above.	
	FLEXOR PROFUNDUS DIGITORUM.	Upper two-thirds, shaft of ulna. Depression on inner side of coronoid process. Interosseous membrane.	4 tendons to bases of last phalanges.
	Flexor Longus Pollicis.	Upper two-thirds, shaft of radius. Interosseous membrane.	Base of last phalanx of thumb.
Extension.	Extensor Carpi Radialis Longior.	Lower one-third, external condyloid ridge of humerus. Intermuscular septum.	Radial side, base of 2d metacarpal bone.
	Extensor Carpi Radialis Brevior.	External condyle. External lateral ligament. Intermuscular septa.	Radial side, base of 3d metacarpal bone.

	Extensor Carpi Ulnaris.	Middle one-third, posterior border of ulna. Fascia of forearm.	Base of 5th metacarpal bone.
	Extensor Secundi Internodii Pollicis.	See above.	
	Extensor Indicis.	Shaft of ulna, posteriorly. Interosseous membrane.	2d and 3d phalanges of index finger.
	Extensor Communis Digitorum.	External condyle. Deep fascia. Intermuscular septa.	3 tendons into 2d and 3d phalanges of all the fingers.
	Extensor Minimi Digiti.	Same as the one just named.	2d and 3d phalanges of the little finger.
Radial flexion.	Flex. Carp. Rad., Extensor Carp. Rad. Longior and Brevior.	See above.	
	Extensor Ossis Metacarpi Pollicis.	Posterior surfaces, shafts of radius and ulna. Interosseous ligament.	Base of 1st metacarpal bone.
	Extensor Primi Internodii Pollicis.	Posterior surface, shaft of radius. Interosseous membrane.	Base of 1st phalanx of the thumb.
Ulnar flexion.	Ext. Carpi Uln., Flex. Carpi Uln., Subl. and Prof. Digit.	See above.	

THIGH.

MOVEMENT.	MUSCLE.	ORIGIN.	INSERTION.
Flexion (elevation forward).	Psoas Magnus.	See above.	
	Iliacus.	Iliac fossa. Inner margin, iliac crest. Ilio-lumbar ligament. Base of sacrum. Anterior spinous processes of ilium, and notch between them. Capsule of hip-joint.	On and below the lesser trochanter.

MOVEMENT.	MUSCLE.	ORIGIN.	INSERTION.
Flexion (elevation forward).	SARTORIUS. Pectineus. Adductors.	See above.	
	(Gracilis.)	Inner margin, rami of pubes and ischium.	Shaft of tibia, below the inner tuberosity.
	(Gluteus Minimus.)	Ilium, between the middle and inferior curved lines. Margin of the great sacro-sciatic notch.	Anterior border of the great trochanter.
	(Tensor Vaginæ Femoris).	Crest of ilium, anterior part of outer lip. Anterior superior spinous processes.	Fascia lata.
	RECTUS FEMORIS.	See above.	
Extension.	Gluteus Maximus.	Superior curved line and crest of ilium. Last piece of sacrum. Side of coccyx. Great and posterior sacro-sciatic ligaments.	Fascia lata. Rough line between great trochanter and linea aspera.
	Gluteus Medius.	Ilium, between superior and middle curved lines. Fascia of the same part.	Oblique lines on great trochanter.
	Pyriformis.	3 digitations from front of sacrum. Margin of great sacro-sciatic foramen. Great sacro-sciatic ligament.	Upper border of great trochanter.
	Biceps Femoris (long head).	Tuberosity of ischium.	Outer side, head of fibula.
	Adductor Magnus (posterior portion).	Rami of ischium and pubes. Tuberosity of ischium, outer margin, under surface.	Rough line between the great trochanter and linea aspera. Linea aspera. Tubercle above inner condyle of femur.

	Semi-tendinosus.	Tuberosity of ischium (tendon in common with Biceps Femoris). Adjacent aponeurosis.	Upper inner surface, shaft of tibia.
	Semi-membranosus.	Tuberosity of ischium.	Inner tuberosity of tibia.
Abduction.	Tensor Vag. Femoris, Gluteus Min. Pyriformis, Gemelli, Sartorius, Obturator Internus, and Glutens min.	See above.	
Adduction.	The 3 Adductors, Iliacus, Pectineus, Quadratus Fem., Obt. ext., Gracilis, Semi-tend. and membr., Long head of Biceps.	See above.	
Rotation inward.	Tensor Vag. Fem., Gluteus Medius (anterior fibres) and Minimus.	See above.	
Rotation outward.	Pyriformis, Obt. int. & ext., Gemelli, Quadratus Fem., Gluteus Maximus and Medius (post. fibres), Psoas Mag., Iliacus, Pectineus, the 3 Adductors, Biceps, Sartorius.	See above.	

LEG.

MOVEMENT.	MUSCLE.	ORIGIN.	INSERTION.
Flexion.	Biceps, Semi-tend., Semi-membr., Gracilis, Sartorius.	See above.	
	Gastrocnemius.	Condyles of femur. Supra-condyloid ridges. } 2 heads.	By tendo achillis into posterior tuberosity of os calcis.

MOVEMENT.	MUSCLE.	ORIGIN.	INSERTION.
Flexion.	Plantaris.	Outer bifurcation of linea aspera. Posterior ligament of knee-joint.	Os calcis, posterior surface.
	Popliteus.	External condyle of femur. Posterior ligament of knee-joint.	Shaft of tibia, triangular surface above oblique line.
Extension.	Rectus Femoris.	See above.	
	Vastus Externus.	Great trochanter, anterior border. Whole length of linea aspera.	Tuberosity of tibia.
	Vastus Internus and Crureus. (Tensor Vaginæ Femoris.)	Linea aspera, inner lip. Shaft of femur, nearly whole length, anteriorly and laterally.	Tuberosity of tibia.
Rotation outward. (Flexed leg.)	Biceps and Gastrocnemius. (Outer head.)	See above.	
Rotation inward. (Flexed leg.)	Semi-tend. and membr., Sartorius, Gracilis, Popliteus, Plantaris, Gastrocnemius (inner head).		

FOOT.

MOVEMENT.	MUSCLE.	ORIGIN.	INSERTION.
Flexion.	TIBIALIS ANTICUS.	Shaft of tibia, outer tuberosity, and upper two-thirds. Interosseous membrane. Deep fascia. Intermuscular septum.	Inner plantar surface of internal cuneiform bone. Base of 1st metatarsal bone.
	Extensor Proprius Hallicis.	Middle two-fourths of fibula, anteriorly. Interosseous membrane.	Base of last phalanx of the great toe.

	Extensor Longus Digitorum.	Outer tuberosity of tibia. Shaft of fibula, upper three-fourths, anteriorly. Interosseous membrane. Deep fascia. Intermuscular septa.	2d and 3d phalanges of the 4 lesser toes.
	Peroneus Tertius.	Outer, lower one-fourth of fibula. Interosseous membrane. Intermuscular septum.	Base of 5th metatarsal bone.
Extension.	Gastrocnemius and Plantaris.	See above.	
	Soleus.	Shaft of fibula, head and upper half, posteriorly. Tibia, oblique line. Tendinous arch.	Tendo Achillis.
	Flexor Longus Hallicis.	Shaft of fibula, lower two-thirds, internally. Interosseous membrane. Fascia. Intermuscular septum.	Great toe, base of last phalanx.
	Flexor Longus Digitorum.	Shaft of tibia, posteriorly, below the oblique line. Intermuscular septum.	4 lesser toes, bases of last phalanges.
	Tibialis Posticus.	Shaft of tibia, upper one-half, posteriorly. Shaft of fibula, upper two-thirds, internally. Interosseous membrane. Deep fascia. Intermuscular septum.	Tuberosity of scaphoid bone. Internal cuneiform bone. Base of 1st metatarsal bone.
	Peroneus Longus.	Head of fibula and upper two-thirds of shaft. Deep fascia. Intermuscular septa.	Base of 1st metatarsal bone, outer side.
	Peroneus Brevis.	Shaft of fibula, middle one-third, externally. Intermuscular septa.	Base of 5th metatarsal bone, dorsal side.
Rotation outward.	Peroneus Longus, Brevis and Tertius (Extensor Longus Digitorum).	See above.	
Rotation inward.	Tibialis Anticus and Posticus, Flexor Longus Digitorum, Flexor Longus Hallicis.	See above.	

CLASSIFIED LISTS OF EXERCISES

For teachers in schools or gymnasia, who wish to make their own tables.

In these lists, all the laws of progression have been carried out as exactly as possible.

It is not intended that *all* the movements should be used, but they have been brought in so as to show their relative progression. According to the proficiency of the pupils, the teacher skips every two, three, etc., movements within each class of exercise. Besides, too strict an adherence to these lists would produce too much monotony and so lessen the educational value of the exercises.

ARCH-FLEXIONS.*

1. Wg. st. arch flex.
2. Wg. stride st. arch flex.
3, 4. Wg. wlk. *b* (*c*) st. arch flex.
5. Wg. close st. arch flex.
6. 7. Wg. sup. st. (stride st.) (hor. bar at sacrum) arch flex.
(8. Wg. turn wlk. *a* st. arch flex.)
(9. Wg. turn stride st. arch flex.)
(10, 11. Wg. turn st. (close st.) arch flex.)
(12. Yd. turn wlk. *a* st. arch flex.)
13, 14. Yd. wlk. *b* (*c*) st. arch flex.
15, 16. Yd. sup. st. (stride st.) arch flex. over hor. bar.
(17. Yd. turn stride st. arch flex.)
18, 19. Yd. st. (close st.) arch flex.
(20, 21. Yd. turn st. (close st.) arch flex.)
22. Yd. Stride st. arch flex.
(23, 24. ½ str. wg. turn wlk. *a* st. arch flex.)
25, 26. ½ Str. wg. wlk. *b* (*c*) st. arch flex.
27, 28. ½ Str. wg. sup. st. (stride st.) arch flex.
(29. ½ Str. wg. turn stride st. arch flex.)
30, 31. ½ Str. wg. st. (close st.) arch flex.
(32, 33. ½ Str. wg. turn st. (close st.) arch flex.)
34. ½ Str. wg. stride st. arch flex.
35, 36. Bend arch sup. st. (stride st.) 2 A. ext. sidew.
(37. Str. turn wlk. *a* st. arch flex.)
38, 39. Str. wlk. *b* (*c*) st. arch flex.
40. Str. sup. stride st. arch flex.
(41. Str. turn stride st. arch flex.)

* Backw. flex. from turn pos. is strictly speaking a. lat T. movt.; but, in absence of apparatus it may be used as an arch flexion; hence its appearance on this list.

42, 43. Str. st. (close st.) arch flex.
(44, 45. Str. turn st. (close st.) arch flex.
46. Str. sup. st. arch flex.
47. Str. stride st. arch flex.
48. Gr. arch st. pos.
(49. Rest turn walk *a* st. arch flex.)
50. Gr. arch stride st. pos.
51. Rest. sup. st. arch flex.
52. Gr. arch stride st. 2 Heel-elev.
53. Rest sup. stride st. arch flex.
54. Gr. arch st. 2 Heel-elev.
55. Gr. arch st. Kn. upw. flex. *a* (change feet in two counts).
56, 57. Rest. wlk. *b* (*c*) st. arch flex.
58, 59. Bend arch sup. st. (stride st.) alt. A. ext. upw.
60. Gr. arch st. Kn. upw. flex. *b* (change feet in one count).
(61. Rest turn stride st. arch flex.)
62. Gr. arch cr. *a* ½ st. Kn. ext. forw.
63, 64. Rest. st. (close st.) arch flex.
65. Gr. arch st. L. elev. *a* forw. (change in two counts.)
(66, 67. Rest turn st. (close st.) arch flex.).
68. Gr. arch st. L. elev. *b* forw. (change in one count).
69. Rest stride st. arch flex.
70. Gr. arch st. 2 A. flex.
71. Fallhang. to gr. arch st.
(72. Bend arch turn wlk. *a* st. 2 A. ext. sidew.)
73. Bend arch sup. st. 2 A. ext. upw.
74, 75. Bend arch wlk. *b* (*c*) st. 2 A. ext. sidew.
76. Gr. arch stride st. Hand trav. *a* (to the same bar).
(77. Bend arch turn stride st. 2 A. ext. sidew.)
78. Gr. arch st. Hand trav. *a*.
79, 80. Bend arch st. (close st.) 2 A. ext. sidew.
(81, 82. Bend arch turn st. (close st.) 2 A. ext. sidew.)
83. Bend arch stride st. 2 A. ext. sidew.

(84. Bend arch turn wlk. *a* st. alt. A. ext. upw.)
85, 86. Bend arch wlk. *b* (*c*) st. alt. A. ext. upw.
87. Oblique gr. arch stride st. 2 Heel-elev.
(88. Bend arch turn stride st. alt. A. ext. upw.)
89. Oblique gr. arch st. 2 Heel-elev.
90, 91. Bend arch st. (close st.) alt. A. ext. upw.
92. Oblique gr. arch st. Kn. upw. flex. *a*.
(93, 94. Bend arch turn st. (close st.) alt. A. ext. upw.)
95. Oblique gr. arch st. Kn. upw. flex *b*.
96. Bend arch stride st. alt. A. ext. upw.
97. Oblique gr. arch cr *a* ½ st. Kn. ext. forw.
98. Yd. *a* turn wlk. *a* st. 2 A. flg.
99. Oblique gr. arch st. L. elev. *a* forw.
100, 101. Yd. *a* arch wlk. *b* (*c*) st. 2 A. flg.
102. Oblique gr. arch st. L. elev. *b* forw.
103. Yd. *a* arch turn stride st. 2 A. flg.
104. Oblique gr. arch st. 2 A. flex.
105, 106. Yd. *a* arch st. (close st.) 2 A. flg.
107. Gr. arch stride st. Hand trav. *b* (skip one bar).
(108, 109. Yd. *a* arch turn st. (close st.) 2 A. flg.)
110. Gr. arch st. Hand trav. *b*.
111. Yd. *a* arch stride st. (close st.) 2 A. flg.
112. Gr. arch stride st. Hand trav. *c* (both hands simultaneously).
113. Bend arch st. alt. A. ext. upw. & F. placing forw.
114. Gr. arch st. Hand trav. *c*.
115. Yd. *a* arch st. 2 A. flg. & F. placing forw.
116. Bend. gr. arch st. L. elev. *a* forw.
(117. Bend turn wlk. *a* st. 2 A. ext. upw.)
118. Gr. arch stride st. Hand trav. *d* (both hands and skip a bar).
119, 120. Bend arch wlk. *b* (*c*) st. 2 A. ext. upw.
121. Gr. arch st. Hand trav. *d*.
(122. Bend arch turn stride st. 2 A. ext. upw.)
123. Gr. arch cr. *a* ½ st. Heel-elev.
124, 125. Bend arch st. (close st.) 2 A. ext. upw.
126. Gr. arch cr. *b* ½ st. Heel-elev.
(127, 128. Bend arch turn st. (close st.) 2 A. ext. upw.)
129. Gr. arch cr. *a* ½ st. 2 A. flex.
130. Bend arch stride st. 2 A. ext. upw.
131. Gr. arch cr. *b* ½ st. 2 A. flex.
(132. Str. arch turn wlk. *a* st. 2 A. ext. upw.)
133. Gr. arch cr. *a* toe ½ st. Kn. ext. forw.
134, 135. Str. arch wlk. *b* (*c*) st. 2 A. ext. upw.
136. Gr. arch cr. *b* toe ½ st. 2 A. flex.
(137. Str. arch turn stride st. 2 A. ext. upw.)
138. Bend arch toe st. L. elev. *a* forw.
139, 140. Str. arch st. (close st.) 2 A. ext. upw.
141. Oblique gr. arch cr. *a* ½ st. Heel-elev.
(142, 143. Str. arch turn st. (close st.) 2 A. ext. upw.)
144. Oblique gr. arch cr. *b* ½ st. Heel-elev.
145. Str. arch stride st. 2 A. ext. upw.
146. Oblique gr. arch cr. *b* ½ st. 2 A. flex.
147. Str. arch wlk. *b* st. 2 A. ext. upw. & ch. F.
148. Oblique gr. arch cr. *a* toe ½ st. Kn. ext.
149. Oblique gr. arch cr. *b* toe ½ st. 2 A. flex.
150. Oblique gr. arch toe st. L. elev. *a* forw.
151. Yd. *c* arch turn wlk. *a* st. 2 A. flg. & ch. F. (see XCIX. 3).
152. ½ str. gr. wg. arch stride st. 2 Heel-elev.
153. Str. arch turn wlk. *a* st. 2 A ext. upw. & ch. F. (see C. 3).

* * *

154. ½ str. gr. wg. arch st. 2 Heel-elev.
155. ½ str. gr. wg. arch st. kn. upw. flex.
156. ½ str. gr. wg. arch cr. *a* ½ st. Kn. ext. forw.
157. ½ str. gr. wg. arch st. L. elev. *a* forw.
158. ½ str. gr. wg. arch st. stride st. A. flex.
159. ½ str. gr. wg. arch st. A. flex.
160. ½ str. gr. wg. arch cr. *a* ½ st. Heel-elev.
161. ½ str. gr. wg. arch cr. *b* ½ st. Heel-elev.
162. ½ str. gr. wg. arch cr. *a* ½ st. A. flex.
163. ½ str. gr. wg. arch cr. *b* ½ st. A. flex.
164. ½ str. gr. wg. arch cr. *a* toe ½ st. Kn. ext.
165. ½ str. gr. wg. arch cr. *b* toe ½ st. A. flex.

166. ½ str. gr. wg. arch toe st. L. elev. *a* forw.
167. ½ str. gr. wg. arch stride st. Hand trav. downw.
168. ½ str. gr. wg. arch st. Hand trav. downw.
169, 170, 171. Gr. arch st. sidew. marching; 1. Head leads; *a.* (one hand at a time); *b.* (both hands simultaneously). 2. Feet lead.
172, 173, 174, 175. Gr. arch stride st., hands on the ground; *a.* pos.; *b.* 2 A. flex.; *c.* sidew. marching; *d.* forw. & backw. marching.

HEAVING-MOVEMENTS.*

St. H. flex. backw. (also forw.).
St. H. rot.
St. H. flex. sidew.
St. H. rot. with forw. and backw. flex.

* * *

St. 2 A. ext. sidew.
St. 2 A. ext. upw.
St. 2 A. ext. forw.
St. 2 A. ext. backw.
and combinations as on page 51.

* * *

1. Hor. walking on stall-bars ("one! . . . Four! *or* One! Two! . . . ")
2. Walking upw. on stall-bars, rope ladders, etc.
3. Fallhang. pos.
4. { over / double / under } gr. hang. pos.
5. Over gr. hang. oscillation (hands still).
6. Arch hang. on upper stall-bars (legs backw. lift!).

* It is to be remembered that the progression in this class of exercise is largely dependent upon individuality, and hence that this list is only approximate.

7. Over gr. hang. oscillatory trav.
8. Introd. to cr. hang. (hang, face out, on upper stall-bar).
9. Fallhang. 2 A. flex.
10. Hor. serpentine, head first (hor. ladder).
11. Cr. *a* hang. pos., one leg (change in one or two counts) (stall-bars).
12. Fallhang. sagittal hor. trav. (bar. Feet drag or walk on the floor).
13. Change legs on oblique rope.
14. Double gr. hang. osc. trav. (bar or high parallels).
15. Hor. serp., feet first (hor. ladder).
16. Arch hang. pos. on ropes or stall-bars.
17. 2 Cr. *a* hang. pos. (stall-bars).
18. Fallhang. transv. trav. (bar).
19. Bal. hang. pos.
20. Diagonal serp., hor. ladder.
21. Bend fallhang. H. rot.
22. Oblique rope climb, head first.
23. Spiral serp., vert. ladder (two pupils around each other).
24. Climb on vert. ropes, horizontally from rope to rope.
25. Diag. serp. on vert. ladder.
26. Und. gr. hang. 2 A. flex.
27. Fallhang. vert. trav. on ropes (sit on the floor and climb into str. gr. st. pos.).
28. Bal. hang. sidew. trav., one hand at a time.
29. Stoophang. pos. on stall-bars.
30. Bend fallhang. sidew. trav. (hor. bar).
31. 2 Cr. *a* hang. alt. Kn. ext. (stall-bars).
32. Arch hang. pos., hor. bar.
33. Cr. hang. alt. L. elev. (stall-bars).
34. Double gr. hang. 2 A. flex.
35. Bal. hang. sagittal trav. (parallel bars), one hand at a time.
36. Zigzag vert. serp. (straight up in vert. ladder).
37. Over gr. hang. 2 A. flex.
38. Climb. on pole or rope.
39. Und. gr. hang. osc. trav.

40. Oblique rope climb, feet first.
41. Diag. serp., down head first; hor. ladder.
42. 2 Cr. *a* hang. 2 kn. ext. (stall-bars).
43. Arch hang. 2 A. flex.
44. Bend und. gr. hang. H. rot.
45. Climb. vert. ropes, diagonally from rope to rope.
46. Bend arch hang. H. rot.
47. Und. gr. Cr. hang. somersault.
48. Bal. hang. 2 A. flex. (parallel bars).
49. Diagonal serp., down head first; vert. ladder.
50. Arch hang. vert. trav. on ropes (compare 27).
51. Bend. und. gr. hang. hor. trav.
52. 2 Cr. *a* hang. alt. Kn. ext. on hor. bar.
53. Arch hang. transv. trav.
54. Bend double gr. hang. hor. trav. ("nose in the groove").
55. 2 Cr. *a* hang. 2 Kn. ext. on hor. bar (or ropes).
56. Arch hang. sagittal trav. (hor. bar).
57. Bal. hang. 2 hand trav. sidew.
58. Bend double gr. hang. vert. trav. (ropes or ladder).
59. Bend double gr. hang. hor. trav. w. alt. elev.
60. Arch hang. alt. L. elev. backw.
61. Bal. hang. sagittal 2 hand trav. (parallel bars).
62. 2 Cr. *a* hang. 2 Kn. abd. (stall-bars).
63. Bend overgr. hang. hor. trav. (hor. bar).
64. Bend arch. hang. transv. trav. (hor. bar or stall-bars).
65. 2 Cr. hang. 2 L. elev. (stall-bars).
66. Single rotary climb. on oblique rope (one leg over).
67. Bend und. gr. hang. diag. trav. (hor. bar inclined).
68. 2 Cr. hang. 2 L. swing. over bar (double bars).
69. Spiral serp. down head first (vert. ladder).
70. 2 Cr. *a* hang. 2 Kn. abd., hor. bar. (or ropes).
71. Over gr. ½ Kn. hang. swing up to bal. ½ sitt. (also trav. sidew.).
72. Bend double gr. hang. diag. trav. oblique rope.
73. Bend arch. hang. saggital trav.
74. Bal. hang. to high sitt. (also trav. sidew.).
75. 2 Cr. hang. 2 L. elev., on hor. bar.
76. Climb rope and "make fast" (arms in yd. *c* pos.).
77. Bend over gr. hang. diag. trav. (inclined bar, oblique rope, etc.).
78. 2 Cr. *b* hang 2 L. abd. on stall-bars.
79. Bend arch hang. alt. L. elev. backw.
80. High sitt. somersault. backw. (hor. bar).
81. Over gr. hang. 2 A. flex. to ½ rev. bend bal. hang pos.
82. Bend double gr. hang. 2 hand trav. (hor. bar).
83. Climb rope and slide down head first.
84. 2 Cr. *b* hang. 2 L. abd. on hor. bar (or ropes).
85. Stoophang. 2 A. flex. (ropes or parallel bars).
86. Bend Cr. hang. trav. forw. w. 2 L. swing over bar (double bars).
87. Bend over gr. hang. 2 hand trav.
88. 2 Cr. *a* hang. 2 A. flex.
89. Stoophang. vert. trav. on ropes.
90. Bend und. gr. hang. 2 hand trav.
91. Stoophang. somersault to high sitt. ("skin a cat" on bar).
92. Bend over gr. hang. 2 hand trav. on hor. ladder (laid on hooks).
93. 2 Cr. *b* hang. 2 A. flex.
94. Double rotary climb on oblique rope (both legs over).
95. Bend double gr. 2 Cr. *b* hang. hor. trav. (hor. bar).
96. Stoophang. vert. 2 Hand trav. on ropes.
97. Bend over gr. hang. rotary trav. on hor. bar.
98. Over gr. hang. 2 A. flex. to bal. hang pos.
99. Bend 2 Cr. *b* hang. vert. trav. (ropes).
100. Bend over gr. 2 Cr. *b* hang. sidew. trav. on hor. bar, etc.

BALANCE MOVEMENTS.

1. Wg. st. 2 Heel-elev.*
2. Wg. stride st. 2 Heel-elev.
3. Wg. close st. 2 Heel-elev.
4. Wg. wlk. *a* st. 2 Heel-elev.
5. Wg. wlk. *b* st. 2 Heel-elev.
6. Wg. st. alt. toe-elev.
7. Wg. wlk. *c* st. 2 Heel-elev.
8. Wg. st. alt. 2 Heel and toe elev.
9. Wg. wlk. *d* st. 2 Heel-elev.
10. Wg. toe st. H. rot.
11. Yd. *c* st. 2 Heel-elev.
12. Yd. *c* stride st. 2 Heel-elev.
13. Yd. *c* close st. 2 Heel-elev.
14. Yd. *c* wlk. *a* st. 2 Heel-elev.
15. Yd. *c* wlk. *b* st. 2 Heel-elev.
16. Yd. *c* st. alt. toe elev.
17. Yd. *c* wlk. *c* st. 2 Heel-elev.
18. Yd. *c* alt. 2 toe and heel elev.
19. Yd. *c* wlk. *d* st. 2 Heel-elev.
20. Yd. *c* toe st. H. rot.
21. Rest st. 2 Heel-elev.
22. Rest stride st. 2 Heel-elev.
23. Rest close st. 2 Heel-elev.
24. Rest wlk. *a* st. 2 Heel-elev.
25. Rest wlk. *b* st. 2 Heel-elev.
26. Rest. st. alt toe-elev.
27. Rest wlk. *c* st. 2 Heel-elev.
28. Rest st. alt. 2 Heel and toe elev.
29. Str. st. 2 Heel-elev.
30. Str. stride st. 2 Heel-elev.
31. Str. close st. 2 Heel-elev.
32. Str. wlk. *a* st. 2 Heel-elev.
33. Str. wlk. *b* st. 2 Heel-elev.
34. Str. st. alt. toe and Heel-elev.
35. Str. wlk. *c* st. 2 Heel-elev.

* Movts. 3 to 37 inclusive are usually put in as introd. or slow leg movts, and progression goes from 2 to 38.

36. Str. st. alt. 2 Heel and toe-elev.
37. Str. wlk. *d* st. 2 Heel-elev.
38. Wg. st. 2 Kn. flex.
39. Wg. wlk. *b* st. 2 Kn. flex.
40. Wg. st. L. elev. backw.
41. Wg. close st. slow march on tip-toe.
42. Wg. courtesy st. H. rot.
43. Wg. stride st. 2 Kn. flex.
44. Wg. Cr. *a* ½ st. pos.
45. Wg. stride courtesy st. H. rot.
46. Wg. fallout *a* pos. forw.
47. Wg. st. 2 Kn. flex. to sitt.
48. Wg. Cr. *a* ½ st. F. flex. and ext.
49. Wg. courtesy sitt. H. rot.
50. Wg. fallout *b* pos. backw.
51. Wg. stride st. 2 Kn. flex. to sitt.
52. Wg. Cr. *a* ½ st. Kn. ext. backw.
53. Wg. stride courtesy sitt. H. rot.
54. Wg. fallout *c* pos. forw.
55. Wg. st. L. elev. sidew.
56. Wg. fallout *a* pos. backw.
57. Wg. toe st. 2 Kn. flex. to sitt.
58. Wg. fallout *b* pos. forw.
59. Wg. Cr. *a* ½ st. Kn. ext. forw.
60. Wg. fallout *c* pos. backw.
61. Wg. toe stride st. 2 Kn. flex. to sitt.
62. Wg. fallout *d* pos.
63. Wg. wlk. *a* st. 2 Kn. flex.
64. Wg. wlk. *d* st. 2 Kn. flex.
65. Wg. Cr. *a* ½ st. Kn. abd.
66. Wg. toe st. alt. Kn. flex. upw.
67. Yd. *c* st. 2 Kn. flex.
68. Yd. *c* courtesy st. 2 A. ext. sidew.
69. Yd. *c* wlk. *b* st. 2 Kn. flex.
70. Yd. *a* courtesy st. 2 A. fling.
71. Yd. *c* st. L. elev. backw.
72. Bend st. 2 A. ext. sidew. and 2 Heel elev.
73. Yd. *c* close toe st. slow march.
74. Yd. *c* courtesy st. H. rot.
75. Yd. *c* stride st. 2 Kn. flex.
76. Yd. *c* Cr. *a* ½ st. pos.

77. Yd. *c* stride courtesy st. H. rot.
78. Yd. *c* st. 2 Kn. flex. to sitt.
79. Yd. *c* courtesy sitt. 2 A. ext. sidew.
80. Yd. *c* Cr. *a* ½ st. F. flex. and ext.
81. Yd. *c* courtesy sitt. 2 A. fig.
82. Bend st. 2 A. ext. upw. and 2 Heel elev.
83. Yd. *c* courtesy sitt. H. rot.
84. Yd. *c* stride st. 2 Kn. flex. to sitt.
85. Yd. *c* Cr. *a* ½ st. Kn. ext. backw.
86. Yd. *c* stride courtesy sitt. H. rot.
87. Rest. st. L. elev. sidew.
88. Yd. *c* toe st. 2 Kn. flex. to sitt.
89. Yd. *c* Cr. *a* ½ st. Kn. ext. forw.
90. Yd. *c* toe stride st. 2 Kn. flex. to sitt.
91. Yd. *c* wlk. *a* st. 2 Kn. flex.
92. Bend toe st. 2 A. ext. sidew. and 2 Kn. flex.
93. Yd. *c* wlk. *d* st. 2 Kn. flex.
94. Yd. *c* Cr. *a* ½ st. Kn. abd.
95. Wg. hor. ½ st. pos.
96. Reach courtesy sitt. L. ext. forw.
97. Yd. *c* toe st. alt. Kn. flex. upw.
98. Str. st. 2 Kn. flex.
99. Str. wlk. *b* st. 2 Kn. flex.
100. Str. courtesy st. 2 A. ext. upw.
101. Rest st. L. elev. backw.
102. Rest close toe st. slow march.
103. Str. stride st. 2 Kn. flex.
104. Rest cr. *a* ½ st. pos.
105. Str. st. 2 Kn. flex. to sitt.
106. Wg. courtesy sitt. 2 A. ext. to ½ str. yd.
107. Rest cr. *a* ½ st. F. flex. and ext.
108. Yd. *d* courtesy sitt. 2 A. elev.
109. Str. courtesy sitt. 2 A. ext. upw. (or sidew. and upw.).
110. Str. stride st. 2 Kn. flex. to sitt.
111. Rest. cr. *a* ½ st. Kn. ext. backw.
112. Str. st. L. elev. sidew.
113. Str. toe st. 2 Kn. flex. to sitt. pos.
114. Str. cr. *a* ½ st. Kn. ext. forw.
115. Str. toe stride st. 2 Kn. flex. to sitt.
116. Str. wlk. *a* st. 2 Kn. flex.
117. Yd. *d* st. 2 A. elev. w. L. elev. sidew.
118. Rest wlk. *d* st. 2 Kn. flex.
119. Bend toe st. 2 A. ext. upw. and 2 Kn. flex.
120. Rest cr. *a* ½ st. Kn. abd.
121. Bend st. 2 A. ept. upw. w. L. elev. sidew.
122. ½ str. hor. ½ st. pos.
123. Bend toe stride st. 2 A. ext. upw. and 2 Kn. flex.
124. Wg. st. L. elev. sidew. w. Heel elev.
125. Reach cr. *b* ½ st. Kn. flex. to sitt.
126. Str. toe st. alt. Kn. upw. flex.
127. Rest st. 2 Kn. flex.
128. Reach st. 2 A. fig. upw. w. L. elev. backw.
129. Rest wlk. *b* st. 2 Kn. flex.
130. Str. st. L. elev. backw.
131. Str. close toe st. slow march.
132. Rest stride st. 2 Kn. flex.
133. Str. cr. *a* ½ st. pos.
134. Rest st. 2 Kn. flex. to sitt.
135. Str. cr. *a* ½ st. F. flex. and ext.
136. Rest stride st. 2 Kn. flex. to sitt.
137. Str. cr. *a* ½ st. Kn. ext. backw.
138. Yd. *c* st. L. elev. sidew.
139. Rest toe st. 2 Kn. flex. to sitt. pos.
140. St. 2 A. elev. sidew. w. L. elev. sidew.
141. Rest cr. *a* ½ st. Kn. ext. forw.
142. Yd. *c* st. L. elev. sidew. w. Heel elev.
143. Rest toe stride st. 2 Kn. flex. to sitt.
144. Str. st. L. elev. sidew. w. Heel elev.
145. Rest wlk. *a* st. 2 Kn. flex.
146. Str. wlk. *d* st. 2 Kn. flex.
147. Rest st. L. elev. sidew. w. Heel elev.
148. Str. cr. *a* ½ st. Kn. abd.
149. St. 2 A. elev. sidew., L. elev. sidew. and Heel elev.
150. Str. hor. ½ st. pos.
151. Yd. *d* st. 2 A. elev. L. elev. sidew. and Heel elev.
152. Reach cr. *b* ½ courtesy sitt. change of F. (by jumping).
153. Bend st. 2 A. alt. upw. L. elev. sidew. and Heel elev.

154. Rest. toe st. alt. Kn. flex. upw.
155. Str. hor. ½ st. Kn. flex. to reach cr. *b* ½ courtesy sitt. pos.
156. Reach st. 2 A. flg. upw. L. elev. backw. and Heel elev.
157. Bal. wlk. on hor. bar, etc., etc.

SHOULDER-BLADE MOVEMENTS.

1. Yd. *a* st. 2 A. flg.
2. ½ str. st. pos.
3. Wg. stoop st. (stride st.) H. rot.
4. A. flg. to ½ str. pos.
5. Bend st. alt. A. ext. upw., or sidew., or forw.
6. Yd. *c* st. 2 A. rot.
7. St. 2 A. ext. to Yd. *d*.
8. Bend st. alt. A. ext. to Yd. *d*.
9. Wg. forw. ly. pos.
10. St. 2 A. swim.
11. St. 2 A. ext. sidew. and backw.
12. Reach st. 2 A. flg. sidew.
13. Yd. *c* stoop (stride) st. H. rot.
14. St. 2 A. flg. upw.
15. ½ str. yd. *c* st. pos.
16. Yd. *c* stoop (stride) st. 2 A. rot.
17. ½ str. reach st. pos.
18. Wg. forw. ly. H. rot.
19. Yd. *c* stoop (stride) st. 2 A. circ.
20. ½ yd. *c* reach st. pos.
21. Yd. *a* stoop (stride) st. 2 A. flg.
22. Reach st. 2 A. flg. upw.
23. Yd. *c* st. 2 A. flg. forw.
24. Stoop (stride) st. 2 A. ext. sidew. and backw.
25. Wg. stoop (stride) st. 2 A. swim.
26. Bend stoop (stride) st. alt. A. ext. upw.
27. Reach stoop (stride) st. 2 A. flg. sidew.
28. Wg. stoop (stride) st. 2 A. ext. to ½ str. yd. *c*.
29. Bend stoop (stride) st. alt. A. ext. to yd. *d*.
30. Str. stoop (stride) st. 2 A. ext. upw.
31. Yd. *b* st. 2 A. flg.
32. Bend stoop (stride) st. 2 A. ext. upw.
33. Str. stoop (stride) st. 2 A. flg. upw. (Forw. — sink! Upw. — fling!)
34. Str. stoop (stride) st. 2 A. elev. (Sidew. — sink! Lift!)
35. Reach stoop (stride) st. 2 A. flg.
36. Yd. *d* stoop (stride) st. 2 A. elev.
37. Bend stoop (stride) st. slow 2 A. ext. to Yd. *d*.
38. ½ str. yd. *d* stoop (stride) st. 2 A. elev.
39. Yd. *b* stoop (stride) st. 2 A. flg.
40. Yd. *e* stoop (stride) st. slow 2 A. ext. upw.
41. Yd. *c* fallout (*a*) *b* H. rot.
42. Yd. *c* fallout (*a*) *b* 2 A. circ.
43. Yd. *c* forw. ly. pos.
44. Yd. *a* fallout (*a*) *b* 2 A. flg.
45. Wg. fallout (*a*) *b* 2 A. ext. sidew. and backw.
46. Yd. *c* fallout *b* 2 A. rot.
47. Wg. fallout (*a*) *b* 2 A. swim.
48. Yd. *c* forw. ly. 2 A. ext. sidew.
49. Bend forw. ly. alt. A. ext. to Yd. *d*.
50. Bend fallout (*a*) *b* alt. A. ext. upw.
51. Reach fallout (*a*) *b* 2 A. flg. sidew.
52. Wg. fallout (*a*) *b* 2 A. ext. to ½ str. Yd. *c*.
53. Str. fallout (*a*) *b* 2 A. ext. upw.
54. Bend fallout (*a*) *b* 2 A. ext. upw.
55. Str. fallout (*a*) *b* 2 A. flg. (comp. 31).
56. Str. fallout (*a*) *b* 2 A. elev. (comp. 32).
57. Reach fallout (*a*) *b* 2 A. flg.
58. Yd. *d* fallout (*a*) *b* 2 A. elev.
59. Wg. fallout (*a*) *b* slow 2 A. ext. to Yd. *d*.
60. Yd. *a* forw. ly. 2 A. flg.
61. ½ str. yd. *d* fallout (*a*) *b* 2 A. elev.
62. Yd. *b* fallout (*a*) *b* 2 A. flg.
63. Yd. *e* fallout (*a*) *b* slow 2 A. ext. upw.
64. Yd. *c* fallout (*c*) *d* H. rot.
65. Yd. *c* fallout (*c*) *d* 2 A. circ.
66. Yd. *c* forw. ly. 2 A. rot.
67. Yd. *a* fallout (*c*) *d* 2 A. flg.
68. Wg. fallout (*c*) *d* 2 A. ext. sidew. and backw.
69. Yd. *c* fallout (*c*) *d* 2 A. rot.

70. Bend forw. ly. slow 2 A. ext. to Yd. *d*.
71. Wg. fallout (*c*) *d* 2 A. swim.
72. Bend fallout (*c*) *d* alt. A. ext. to Yd. *d*.
73. Bend fallout (*c*) *d* alt. A. ext. upw.
74. Reach fallout (*c*) *d* 2 A. flg. sidew.
75. Wg. fallout (*c*) *d* 2 A. ext. to ½ str. Yd. *c*.
76. Str. fallout (*c*) *d* 2 A. ext. upw.
77. Bend fallout (*c*) *d* 2 A. ext. upw.
78. Str. fallout (*c*) *d* 2 A. flg. (comp. 31).
79. Wg. forw. ly. 2 A. swim.
80. Str. fallout (*c*) *d* 2 A. elev. (comp. 32).
81. Reach fallout (*c*) *d* 2 A. flg.
82. Yd. *d* fallout (*c*) *d* 2 A. elev.
83. Wg. fallout (*c*) *d* 2 A. ext. to Yd. *d*.
84. ½ str. yd. *d* fallout (*c*) *d* 2 A. elev.
85. Yd. *b* fallout (*c*) *d* 2 A. flg.
86. Yd. *e* fallout (*c*) *d* slow 2 A. ext. upw.
87. Yd. *c* F. gr. fallout H. rot.
88. Yd. *c* F. gr. fallout 2 A. circ.
89. Yd. *a* F. gr. fallout 2 A. flg.
90. Reach forw. ly. 2 A. flg. sidew.
91. Wg. F. gr. fallout 2 A. ext. sidew. and backw.
92. Bend forw. ly. alt. A. ext. upw.
93. Yd. *c* F. gr. fallout 2 A. rot.
94. Bend F. gr. fallout alt. A. ext. to Yd. *d*.
95. Wg. F. gr. fallout 2 A. swim.
96. Bend F. gr. fallout alt. A. ext. upw.
97. Reach F. gr. fallout 2 A. flg. sidew.
98. Wg. F. gr. fallout 2 A. ext. to ½ str. Yd.
99. Str. F. gr. fallout 2 A. ext. upw.
100. Bend F. gr. fallout 2 A. ext. upw.
101. Str. F. gr. fallout 2 A. flg. (comp. 31).
102. Wg. forw. ly. 2 A. ext. to ½ str. Yd.
103. Str. F. gr. fallout 2 A. elev.
104. Reach F. gr. fallout 2 A. flg.
105. Yd. *d* F. gr. fallout 2 A. elev.
106. Wg. F. gr. fallout 2 A. ext. to Yd. *d*.
107. ½ str. yd. *d* F. gr. fallout 2 A. elev.
108. Yd. *b* F. gr. fallout 2 A. flg.
109. Yd. *e* F. gr. fallout slow 2 A. ext. upw.
110. Yd. *c* turn fallout *a* H. rot.
111. Yd. *c* turn fallout *a* 2 A. circ.
112. Yd. *a* turn fallout *a* 2 A. flg.
113. Wg. turn fallout *a* 2 A. ext. sidew. and backw.
114. Rest. forw. ly. pos.
115. Yd. *c* turn fallout *a* 2 A. rot.
116. Wg. *c* turn fallout *a* 2 A. swim.
117. Bend turn fallout *a* alt. A. ext. upw.
118. Reach turn fallout *a* 2 A. flg. sidew.
119. Wg. turn fallout *a* 2 A. ext. to ½ str. Yd. *c*.
120. Str. turn fallout *a* 2 A. ext. upw.
121. ½ str. rev. turn fallout *a* change of A.
122. Bend turn fallout *a* 2 A. ext. upw.
123. Str. forw. ly. pos.
124. Str. turn fallout *a* 2 A. flg. (comp. 31).
125. Str. turn fallout *a* 2 A. elev. (comp. 32).
126. Reach turn fallout *a* 2 A. flg.
127. Yd. *d* turn fallout *a* 2 A. elev.
128. Wg. turn fallout *a* slow 2 A. ext. to Yd. *d*.
129. ½ str. yd. *d* turn fallout *a* 2 A. elev.
130. Yd. *b* turn fallout *a* 2 A. flg.
131. Str. forw. ly. 2 A. ext. upw.
132. Yd. *e* turn fallout *a* slow 2 A. ext. upw.
133. Str. hor. ½ st. 2 A. ext. upw.
134. ½ str. hor. ½ st. pos.
135. Rest. hor. ½ st. pos.
136. Bend. forw. ly. 2 A. ext. upw.
137. Bend. hor. ½ st. 2 A. ext. upw.
138. Str. fallout (*a*) *b* T. forw. flex.
139. Str. fallout *c* (*d*) T. forw. flex.
140. Str. forw. ly. 2 A. flg. (comp. 31).
141. Str. F. gr. fallout T. forw. flex.
142. Str. turn fallout *a* T. forw. flex.
143. Reach forw. ly. 2 A. flg.
144. Rest fallout (*a*) *b*, *c* T. forw. flex.
145. Yd. *b* forw. ly. 2 A. flg.
146. Rest turn fallout *a* T. forw. flex.
147. Str. forw. ly. 2 A. elev. (comp. 32).
148. A. flg. forw. upw. and fallout *d* backw.
149. 2 A. flg. forw. upw. and fallout *b* backw.
150. Yd. *d* forw. ly. 2 A. elev.

151. A flg. forw. upw. and fallout *d*. forw. (ch. F. forw. in one count).
152. Bend hor. ½ st. slow 2 A. ext. upw.
153. Yd. *e* forw. ly. slow. 2 A. ext. upw., etc.

ABDOMINAL EXERCISES.

1. Str. gr. ly. alt. L. elev. (benches).
2. Stoopfall pos. ; later F. pl. forw. and backw.
3. Wg. Kn. st. T. backw. flex.
4. Rest. ly. alt. L. elev. (floor).
5. Wg. ½ Kn. st. T. backw. flex.
6. Stoopfall H. rot.
7. Wg. F. gr. sitt. T. backw. flex.
8. Str. gr. ly. exc. 2 L. elev. (Knees upw. bend! Stretch! Legs sink!).
9. Wg. F. gr. ½ st. T. backw. flex.
10. Yd. *c* Kn. st. T. backw. flex.
11. Hor. stoopfall pos.
12. Yd. *c* ½ Kn. st. T. backw. flex.
13. Rest ly. exc. 2 L. elev.
14. Yd. *c* F. gr. sitt. T. backw. flex.
15. Stoopfall. alt. L. elev.
16. Yd. *c* F. gr. ½ st. T. backw. flex.
17. Str. gr. ly. slight 2 L. elev.
18. ½ str. wg. Kn. st. T. backw. flex.
19. Hor. stoopfall. alt. L. elev.
20. ½ str. wg. ½ Kn. st. T. backw. flex.
21. ½ str. wg. F. gr. sitt. T. backw. flex.
22. Rest ly. slight 2 elev.
23. ½ str. wg. F. gr. ½ st. T. backw. flex.
24. Wg. fall Kn. st. T. rot.
25. Inclined stoopfall. pos.
26. Wg. fall ½ Kn. st. T. rot.
27. Wg. fall F. gr. sitt. T. rot.
28. Stoopfall. sidew. trav.
29. Wg. fall F. gr. ½ st. T. rot.
30. Rest Kn. st. T. backw. flex.
31. Str. gr. ly. 2 L. elev. to 90°.
32. Rest ½ Kn. st. T. backw. flex.
33. Rest F. gr. sitt. T. backw. flex.
34. Stoopfall. 2 A. flex.
35. Rest F. gr. ½ st. T. backw. flex.
36. Rest. ly. 2 L. elev. to 90°.
37. Str. Kn. st. T. backw. flex.
38. Stoopfall. alt. A. elev.
39. Str. ½ Kn. st. T. backw. flex.
40. Str. F. gr. sitt. T. backw. flex.
41. Str. gr. ly. 2 L. elev. to 45°.
42. Str. F. gr. ½ st. T. backw. flex.
43. Bend fall Kn. st. 2 A. ext. sidew.
44. Hor. stoopfall. alt. A. elev.
45. Bend fall ½ Kn. st. 2 A. ext. sidew.
46. Bend fall F. gr. sitt. 2 A. ext. sidew.
47. Rest ly. 2 L. elev. to 45°.
48. Bend fall F. gr. ½ st. 2 A. ext. sidew.
49. Yd. *c* fall Kn. st. T. rot.
50. Hor. stoopfall. 2 A. flex.
51. Yd. *c* fall ½ Kn. st. T. rot.
52. Yd. *c* fall F. gr. sitt. T. rot.
53. Str. gr. ly. 2 L. swim.
54. Yd. *c* fall F. gr. ½ st. T rot.
55. Yd. *a* fall Kn. st. 2 A. flg.

56. Hor. stoopfall. sidew. trav.
57. Yd. *a* fall ½ Kn. st. 2 A. flg.
58. Bend stoopfall. alt. L. elev.
59. Yd. *a* fall F. gr. sitt. 2 A. flg.
60. Rest ly. 2 L swim
61. Yd. *a* fall F. gr. ½ st. 2 A. flg.
62. Bend fall Kn. st. alt. A. ext. upw.
63. Stoopfall. alt. A. and L. elev.
64. Bend fall ½ Kn. st. alt. A. ext. upw.
65. Bend fall F. gr. sitt. alt. A. ext. upw.
66. Str. gr. ly. 2 L. abd. (legs elevated to 45°).
67. Bend fall. F. gr. ½ st. alt. A. ext. upw.
68. Rest fall Kn. st. T. rot.
69. Inclin. stoopfall. 2 A. flex.
70. Rest fall ½ Kn. st. T. rot.
71. Rest fall F. gr. sitt. T. rot.
72. Rest ly. 2 L. abd. (compare 66).
73. Rest fall F. gr. ½ st. T. rot.
74. Bend fall Kn. st. 2 A. ext. upw.
75. Wg. F. high gr. ½ st. deep T. backw. flex.
76. Bend fall ½ Kn. st. 2 A ext. upw.
77. Bend fall F. gr. sitt. 2 A. ext. upw.
78. Yd. *c* F. high gr. ½ st. deep T. backw. flex.
79. Bend fall F. gr. ½ st. 2 A. ext. upw.
80. Str. fall Kn. st. T. rot.
81. Rev. stoopfall. pos. (feet against wall).
82. Str. fall. ½ Kn. st. T. rot.
83. Str. fall F. gr. sitt. T. rot.
84. Rest F. high gr. ½ st. deep T. backw. flex.
85. Str. fall F. gr. ½ st. T. rot.
86. Reach fall Kn. st. 2 A. flg.
87. Rev. stoopfall. 2 A. flex.
88. Reach fall ½ Kn. st. 2 A. flg.
89. Reach fall F. gr. sitt. 2 A. flg.
90. Reach fall F. gr. ½ st. 2 A. flg.
91. Str. F. high gr. ½ st. T. backw. flex.
92. Rev. stoopfall. pos. F. free (walk or stand on the hands).
93. Rev. stoopfall. pos. F. on the floor, etc.

LATERAL TRUNK MOVEMENTS.

A. ROTATIONS.*

1. Wg. close st. T. rot.
2. Wg. st. T. rot.
3. Wg. stride st. T. rot.
4. Wg. wlk. *a* st. T. rot.
5. Wg. turn wlk. *a* st. T. backw. flex.
6. Wg. wlk. *a* st. rev. T. rot.
7. Wg. wlk. *b* st. T. rot.
8. Wg. turn stride st. T. backw. flex.
9. Wg. wlk. *c* st. T. rot.
10. Wg. turn st. T. backw. flex.
11. Wg. wlk. *c* st. rev. T. rot.
12. Wg. Kn. st. T. rot.
13. Wg. turn close st. T. backw. flex.
14. Wg. ride sitt. T. rot.
15. Yd. *c* close st. T. rot., later 2 A ext. sidew., from turn pos.
16. Yd. *c* st. T. rot., later 2 A. ext. sidew. from turn pos.
17. Yd. *c* stride st. T. rot., later 2 A. ext. sidew. from turn pos.
18. Yd. *c* wlk. *a* st. T. rot., later 2 A. ext. sidew. from turn pos.
19. Yd. *c* turn wlk. *a* st. T. backw. flex.
20. Yd. *c* wlk. *a* st. rev. T. rot. (2 A. ext. sidew.).
21. Yd. *c* wlk. *b* st. T. rot. (2 A. ext. sidew.).
22. Yd. *c* turn stride st. T. backw. flex.
23. Yd. *c* wlk. *c* st. T. rot. (2 A. ext. sidew.).
24. Yd. *c* turn st. T. backw. flex.
25. Yd. *c* wlk. *c* st. rev. T. rot. (2 A. ext. sidew.).
26. Yd. *c* Kn. st. T. rot.
27. Yd. *c* turn close st. T. backw. flex.

* The infinite variety of combinations that can be made with arm movements in turn pos. and arch turn pos. makes it a hopeless task to enumerate all the exercises that might be included in this group.

28. Yd. *c* ride sitt. T. rot. (2 A. ext. sidew.).
29. Rest close st. T. rot.
30. Rest st. T. rot.
31. Rest stride st. T. rot.
32. Rest wlk. *a* st. T. rot.
33. ½ str. wg. turn wlk. *a* st. T. backw. flex.
34. Rest wlk. *a* st. rev. T. rot.
35. Rest wlk. *b* st. T. rot.
36. ½ str. wg. turn stride st. T. backw. flex.
37. Rest wlk. *c* st. T. rot.
38. ½ str. wg. turn st. T. backw. flex.
39. Rest. wlk. *c* st. rev. T. rot.
40. Rest. Kn. st. T. rot.
41. ½ str. wg. turn close st. T. backw. flex.
42. Rest ride sitt. T. rot.
43. Str. close st. T. rot., later 2 A. ext. upw. from turn. pos.
44. Str. st. T. rot., later 2 A. ext. upw. from turn pos.
45. Str. stride st. T. rot., later 2 A. ext. upw. from turn pos.
46. Str. wlk. *a* st. T. rot., later 2 A. ext. upw., from turn pos.
47. Rest turn wlk. *a* st. T. backw. flex.
48. Str. wlk. *a* st. rev. T. rot.
49. Str. wlk. *b* st. T. rot. (2 A. ext. upw.).
50. Rest turn stride st. T. backw. flex.
51. Str. wlk. *c* st. T. rot. (2 A. ext.).
52. Rest turn st. T. backw. flex.
53. Str. wlk. *c* st. rev. T. rot.
54. Rest turn close st. T. backw. flex.
55. Str. Kn. st. T. rot.
56. Str. ride sitt. T. rot. (2 A. ext.).
57. Yd. *c* stride st. quick T. rot.
58. Wg. fallout *a* T. rot.
59. Wg. fallout *a* rev. T. rot.
60. ½ str. rev. turn fallout *a* pos.
61. Yd. *c* fallout *a* T. rot.
62. ½ str. rev. turn fallout *a* zigzag forw.
63. Str. turn wlk. *a* st. T. backw. flex.
64. Yd. *c* fallout *a* rev. T. rot.
65. Rest fallout *a* T. rot.
66. Str. turn stride st. T. backw. flex.
67. ½ str. rev. turn fallout *a* zigzag backw.
68. Rest fallout *a* rev. T. rot.
69. ½ str. rev. turn fallout *a* ch. of A.
70. Str. turn st. T. backw. flex.
71. Str. stride st. quick T. rot.
72. Str. fallout *a* T. rot.
73. Str. turn close st. T. backw. flex.
74. Str. fallout *a* rev. T. rot.

B. SIDEWAYS-FLEXIONS.

1. Wg. stride st. T. sidew. flex.
2. Wg. st. T. sidew. flex.
3. Wg. close st. T. sidew. flex.
4. Close st. (hanging arms) T. sidew. flex.
5. Wg. wlk. *b* st. T. sidew. flex.
6. Wg. wlk. *c* st. T. sidew. flex.
7. Wg. turn stride st. T. sidew. flex.
8. Wg. turn wlk. *b* st. T. sidew. flex.
9. Wg. turn wlk. *a* st. T. sidew. flex.
10. Wg. turn st. T. sidew. flex.
11. Wg. turn close st. T. sidew. flex.
12. Wg. F. side gr. ½ st. T. sidew. flex.
13. ½ str. wg. stride st. T. sidew. flex.
14. ½ str. wg. st. T. sidew. flex.
15. ½ str. wg. close st. T. sidew. flex.
16. ½ str. wg. wlk. *b* st. T. sidew. flex.
17. ½ str. wg. wlk. *c* st. T. sidew. flex.
18. Wg. side fall. pos.
19. ½ str. wg. turn stride st. T. sidew. flex.
20. ½ str. wg. turn wlk. *b* st. T. sidew. flex.
21. ½ str. wg. turn wlk. *a* st. T. sidew. flex.
22. Wg. side fall. L. elev.
23. ½ str. wg. turn st. T. sidew. flex.
24. ½ str. wg. turn close st. T. sidew. flex.
25. ½ str. wg. F. side gr. ½ st. T. sidew. flex.
26. Rest stride st. T. sidew. flex.
27. Rest st. T. sidew. flex.

28. Rest close st. T. sidew. flex.
29. Rest wlk. *b* st. T. sidew. flex.
30. Rest wlk. *c* st. T. sidew. flex.
31. ¼ str. gr. side fall. L. elev.
32. Rest turn stride st. T. sidew. flex.
33. Rest turn wlk. *b* st. T. sidew. flex.
34. Rest turn wlk. *a* st. T. sidew. flex.
35. Rest turn st. T. sidew. flex.
36. Rest turn close st. T. sidew. flex.
37. Rest F. side gr. ¼ st. T. sidew. flex.
38. Str. stride st. T. sidew. flex.
39. Str. st. T. sidew. flex.
40. Rest st. T. sidew. flex. over bar.
41. Str. close st. T. sidew. flex.
42. Str. wlk. *b* st. T. sidew. flex.
43. Rest wlk. *b* st. T. sidew. flex. over bar.
44. Str. wlk. *c* st. T. sidew. flex.
45. ¼ str. side fall. pos.
46. Str. turn stride st. T. sidew. flex.
47. Str. turn wlk *b* st. T. sidew flex.
48. Rest. st. T. flex. ov. bar w. L. elev.
49. Str. turn wlk. *a* st. T. sidew. flex.
50. Str. turn st. T. sidew. flex.
51. Str. turn close st. T. sidew. flex.
52. ¼ str. sidefall. L. elev.
53. Yd. *c* stride st. T. sidew. flex.
54. Rest. st. T. sidew. flex. w. L. elev.
55. Yd. *c* st. T. sidew. flex.
56. Yd. *c* close st. T. sidew. flex.
57. Wg. F. gr. side fall. L. elev. (upper foot on bar).
58. Yd. *c* wlk. *b* st. T. sidew flex.
59. Yd. *c* wlk. *c* st. T. sidew. flex.
60. Rest. stride st. quick T. sidew. flex.
61. Yd. *c* turn stride st. T. sidew. flex.
62. Str. st. T. sidew. flex. over bar.
63. Yd. *c* turn wlk. *b* st. T. sidew. flex.
64. Yd. *c* turn wlk. *a* st T. sidew. flex.
65. Str. wlk. *b* st. T. sidew. flex. over bar.
66. Yd. *c* turn st. T. sidew. flex.
67. Yd. *c* turn close st. T. sidew. flex.
68. Wg. fallout *b* T. sidew. flex.
69. Str. side gr. ¼ st. L. elev.
70. Yd. *c* fallout *b* T. sidew. flex.
71. Rest fallout *b* T. sidew. flex.
72. Str. st. T. flex. ov. bar w. L. elev.
73. Str. fallout *b* T. sidew. flex.
74. Str. stride st. quick T. sidew. flex.
75. Rest rev. turn fallout *a* T. sidew. flex.
76. Introd. to wheeling.
77. Str. rev. turn fallout *a* T. sidew. flex.
78. Str. st. T. sidew. flex. w. L. elev.
79. Wheeling ("cart-wheel").
80. ¼ str. F. gr. side fall. L. elev. (compare 52).
81. Sidew. hang. pos.

LEAPING.

A. JUMPING.

(The figures after the name indicate the command.)

1. Prep. to jump. "1—4."
2. Upw. jump. 1—5.
3. Wg. toe st. stride jump.
4. Forw. jump. 1—5.
5. Wg. courtesy sitt. jump (hopping).
6. 90° upw. jump. 1—5.
7. Wg. toe st. j. forw. (hopping).
8. Sidew. j. 1—5.
9. Wg. wlk. *b*, change feet (jumping).
10. 2 A. flg. upw. j. 1—5.
11. Yd. toe st. j. forw. (hopping
12. 2 A. and L. flg. upw. j. 1— .
13. Wg. courtesy sitt. sidew. j. (hopping).
14. 1 step, forw. j.
15. Wg. toe ¼ st. j. (hopping).
16. 180° upw. j. 1—5.
17. 2 steps, forw. j. 1—5.

18. Yd. toe ½ st. j. (hopping).
19. 3 steps, forw. j. 1—6.
20. Wg. stride toe st. j., F. strike.
21. Forw. j. over mark. 1—5.
22. Wg. wlk. *d* change F. jump.
23. Sidew. j. over mark. 1—5.
24. Twice upw. j. 1—6.
25. 1 step, forw. j. ov. mark. 1—4.
26. Twice forw. j. 1—6.
27. 2 steps, forw. j. ov. mark. 1—5.
28. Twice 90° upw. j. 1—6.
29. 3 steps, j. ov. mark. 1—6.
30. Twice sidew. j. *a* same side. 1—6.
31. 1 step, 90° j. ov. mark. 1—4.
32. Yd. *c* toe st. alt. L. elev. sidew. in quick time (change in one count).
33. Twice sidew. j. *b* opp. sides. 1—6.
34. 2 steps 90° j. ov. mark. 1—5.
35. 360° upw. j. 1—5.
36. 3 steps, 90° ov. mark. 1—6.
37. 2 A. flg. twice upw. j. 1—6.
38. Prep. to j. "Start."
39. 2 A. and L. flg. twice upw. j. 1—6.
40. Upw. j. "Start."
41. Twice 180° upw. j. 1—6.
42. Forw. j. "Start."
43. Sidew. forw. j. 1—4.
44. 90° upw. j. "Start."
45. Backw. j. 1—5.
46. Sidew. j. "Start."
47. Twice 360° upw. j. 1—6.
48. 2 A. flg. upw. j. "Start."
49. Sidew. and backw. j. 1—6.
50. 2 A. and L. flg. upw. j. "Start."
51. Forw. and backw. j. 1—6.
52. 1 step, forw. j. "Start."
53. Twice upw. j. "Start."
54. 2 steps, forw. j. "Start."
55. Twice forw. j. "Start."
56. 3 steps, forw. j. "Start."
57. 90° twice upw. j. "Start."
58. 180° upw. j. "Start."
59. Twice sidew. j. *a*. "Start."
60. 1 step, 90° forw. j. "Start."
61. Twice sidew. j. *b*. "Start."
62. 2 steps, 90° forw. j. "Start."
63. 360° upw. j. "Start."
64. Twice 2 A. flg. upw. j. "Start."
65. Jump from height.
66. Sidew. forw. j. "Start."
67. 3 steps, 90° forw. j. "Start."
68. Upw. j. 1, 2—3, 4—5.
69. 2 A. and L. flg. twice upw. j. "Start."
70. 1 step, forw. j. "Start—Four."
71. Twice, 180° upw. j. "Start."
72. 2 steps, forw. j. "Start—Five."
73. Backw. j. "Start."
74. 3 steps, forw. j. "Start—Six."
75. Twice, 360° upw. j. "Start."
76. 1 step, 90° forw. j. "Start—Four."
77. 3 steps, 90° forw. j. and land facing front (double jump). "Start."

Jumping from a bench may be put in anywhere after 14; greater heights between this and 64.

Standing and running high and broad jump wherever it says "over mark," etc.

Numerous hopping movements classified as "fancy steps" may be used to swell this list.

B. VAULTING.

1. Reach gr. st. introd. to vault.
2. ½ yd. gr. st. introd. to vault.
3. Face vault over benches.
4. Vault double bar, face up.
5. Somersault over bar.
6. Inside pommel vault on saddles.
7. Vault, double bar, face down.
8. Run. face vault. over low box.
9. Leap-frog into the saddle; horse.
10. St. face vault. over low bar (grad. raised).
11. Star gr. ½ st. jump from stall-bars.

12. Vault. bar with rope.
13. "Sit over," low bar.
14. Vault double bar, face forw.
15. "Sit over," box or horse.
16. Cr. hang. jump from stall-bars.
17. Cr. hang. vault through double bar (both hands on upper bar).
18. Leap-frog on horse.
19. Leap-frog on box.
20. ½ reach gr. ½ st. sidew. vault. over bar ("sit over" sidew.).
21. Run. face vault 180° turn across box.
22. Vault double bar, face up; bars close together.
23. Face vault across box, one hand, spring from one foot.
24. Sit in the saddle from the side, spring from one hand and foot (lengthwise back vault to sit in the saddle).
25. Face vault w. 180° turn over bar.
26. Box lengthwise, swing both legs sidew. to sit in the saddle.
27. Vault bar with rope, bar high.
28. Run. lengthwise back-vault over box.
29. ½ reach gr. ½ st. sidew. vault. over bar and turn 180°.
30. "Leap-frog to sit over" (to land. in ½ yd. gr. st.).
31. Run. face vault over bar.
32. Continuous sidew. vault. over bar.
33. Vault double bar as in 17; bars close together.
34. Inside pommel vault across box ("echapper").
35. St. face vault. over bar, one hand.
36. Long leap frog.
37. Vault bar face up, run for start.
38. Lengthwise face vault on box.
39. St. face vault. over high bar.
40. Leap-frog from one foot.
41. Pole vault.
42. Tiger-jump.
43. Outside pommel vault across box ("écarter").
44. Run. face vault w. 180° turn over bar.
45. Lengthwise back-vault over box, one hand and foot.
46. Balance vault over box.
47. Handspring on pommels (low bar and saddle).
48. Vault to stand in the saddle and jump off forw.
49. Vault double bar, over upper bar.
50. Handspring across box.
51. Jump to stand in the saddle and jump off forw.
52. Leap-frog backw.
53. Handspring lengthwise, to sit in the saddle.
54. Vault to "stand over" lengthwise.
55. Handspring lengthwise on box.
56. Inside pommel vault lengthwise.
57. Vault box face down, and land where you started.
58. Handspring lengthwise on horse, hands strike twice, etc.

The easier vaults on parallel bars may be put in after No. 26; the more difficult ones after No. 50. Besides, any vault may serve as its own progression if the obstacle is raised, better style demanded, etc.

RESPIRATORY EXERCISES.

1. St. 2 A. ext. sidew.
2. Yd. *a* st. 2. A. flg.
3. St. 2 A. elev. sidew.
4. St. 2 A. ext. to Yd. *d*.
5. Yd. *d* st. 2 A. elev.
6. St. 2 A. elev. forw. upw.
7. St. 2 A. elev. sidew. upw.
8. Yd. *c* st. 2 A. circ.
9. St. 2 A. elev. sidew. w. 2 Heel-elev.
10. Yd. *d* st. 2 A. elev. w. 2 Heel-elev.
11. St. 2 A. elev. forw. upw. w. 2 Heel-elev.
12. St. 2 A. elev. sidew. upw. w. 2 Heel-elev.
13. Yd. *a* st. 2 A. flg. w. F. placing forw.
14. Yd. *a* turn close st. 2 A. flg.

15. Turn close st. 2 A. elev. sidew.
16. Bend turn close st. 2 A. ext. to yd. *d*.
17. Yd. *d* turn close st. 2 A. elev.
18. Turn close st. 2 A. elev. forw. upw.
19. Turn close st. 2 A. elev. side. upw.
20. Yd. *c* turn close st. 2 A. circ.
21. Yd. *a* turn stride st. 2 A. flg.
22. St. 2 A. elev. sidew. w. 2 Kn. flex.
23. Turn stride st. 2 A. elev. sidew.
24. Yd. *d* st. 2 A. elev. w. 2 Kn. flex.
25. Bend turn stride st. 2 A. ext. to Yd. *d*.
26. Yd. *a* walking 2 A. flg.
27. Yd. *d* turn stride st. 2 A. elev.
28. Yd. *d* courtesy sitt. 2 A. elev.
29. Turn stride st. 2 A. elev. forw. upw.
30. Yd. *d* toe st. 2 A. elev. and 2 Kn. flex.
31 Turn stride st. 2 A. elev. sidew. upw.
32. Yd. *a* st. 2 A. flg. & half step forw. (toe sup. wlk. *b* pos.).
33. Yd. *c* turn stride st. 2 A. circ.
34. St. 2 A. elev. sidew. upw. & 2 Kn. flex.
35. Yd. *a* fallout (*a*) *b* 2 A. flg. (trunk erect).
36. Bend fallout (*a*) *b* 2 A. Ext. to Yd. *d*.
37. Yd. *d* fallout (*a*) *b* 2 A. elev.
38. Wg. fallout (*a*) *b* 2 A. elev. forw. upw.
39. Wg. fallout (*a*) *b* 2 A. elev. sidew. upw.
40. Yd. *c* fallout (*a*) *b* 2 A. Circ.
41. Yd. *a* fallout (*c*) *d* 2 A. flg.
42. Bend fallout (*c*) *d* 2 A. ext. to yd. *d*.
43. Yd. *d* fallout (*c*) *d* 2 A. elev.
44. Wg. fallout (*c*) *d* 2 A. elev. forw. upw.
45. Wg. fallout (*c*) *d* 2 A. elev. sidew. upw.
46. Yd. *c* fallout (*c*) *d* 2 A. circ.
47. Close st. 2 A. elev. forw. upw. w. T. rot.
48. St. 2 A. elev. forw. upw. w. T. rot.
49. Stride st. 2 A. elev. forw. upw. w. T. rot.
50. Yd. *a* turn fallout *a* 2 A. flg.
51. Bend turn fallout *a* 2 A. ext. to Yd. *d*.
52. Yd. *d* turn fallout *a* 2 A. elev.
53. Wg. turn fallout *a* 2 A. elev. forw. upw.
54. Wg. turn fallout *a* 2 A. elev. sidew. upw.
55. Yd. *c* turn fallout *a* 2 A. circ.
56. Yd. *a* arch st. 2 A. flg.
57. Yd. *c* arch st. 2 A. circ.
58. Yd. *c* arch wlk. *b*. st 2 A. circ.
59. Yd. *a* arch st. 2 A. flg. and F. placing forw., etc.

EXAMPLES OF TABLES OF EXERCISES.

GROUP No. 1.

TWENTY-FIVE tables for a class of children nine to fourteen years old, who have had no previous training.

I.

1. Close st. pos. / Wg. pos. / Bend pos. / Wg. stride st. pos. / Wg. st. H. flex. backw.
2. St. 2 A. ext. upw.
3. Wg. st. arch flex.
4. Wg. st. 2 Heel elev.
5. Marching in place.
6. Yd. *a* st. 2 A. flg.
7. Wg. close st. T. rot.
8. Wg. std. st. T. sidew. flex.
9. Wg. close st. 2 Heel elev.
10. St. 2 A. ext. sidew.

II.

1. Facing 90°. / H. flex. backw. / Wg. st. feet closing rhythmically. / 2 A. ext. sidew. / Wg. wlk. *b* st. pos. / 2 A. ext. upw.
2. Wg. st. arch flex.
3. Hor. walking on stallbars (4 counts).
4. Wg. st. 2 Kn. flex.
5. ½ str. st. pos.
6. Marching.
7. Wg. std. st. T. rot.
8. Wg. st. T. sidew. flex.
9. Wg. std. st. 2 Heel elev.
10. Yd. *a* st. 2 A. flg.

III.

1. Yd. *a* st. 2 A. flg. / Facing 180°. / Wg. st. H. rot. / St. 2 A. ext. forw.; also sidew. / Wg. wlk. *a* st. pos.
2. Wg. std. st. arch flex.
3. Fallhang. pos.
4. Wg. std. st. 2 Kn. flex.
5. A. flg. to ½ str. pos.
6. Marching.
7. Wg. stoop st. H. rot.
8. Str. gr. ly. exc. L. elev.
9. Wg. wlk. *a* st. T. rot.
10. Wg. close st. T. sidew. flex.
11. Wg. wlk. *b* st. 2 Heel elev.
12. Prep. to jump.
13. St. 2 A. elev. sidew.

IV.

1. Wg. st. H. sidew. flex. / Wg. wlk. *c* st. pos. / St. 2 A. ext. backw. (also sidew. and upw.). / Wg. st. 2 Kn. flex.
2. Wg. std. st. arch flex.
3. Hor. trav. on stallbars (2 counts).
4. Wg. courtesy sitt. pos.
5. Bend st. alt. A. ext. upw.
6. Marching and running.
7. Yd. *c* st. 2 A. rot.
8. Str. gr. ly. alt. L. elev.
9. Wg. turn wlk. *a* st. backw. flex.
10. Wg. wlk. *b* st. T. sidew. flex.
11. Wg. wlk. *c* st. 2 Heel elev.
12. Over / Under / Double — gr. hang. pos.
13. Upw. jump.
14. Yd. *d* st. 2 A. elev. / Yd. *a* st. 2 A. flg.

V.

1. Feet close and open; 2 Heel elev.; H. flex.[1] / Wg. wlk. *d* st. pos. / 2 A. ext. forw. and upw. / Wg. Kn. st. pos.

[1] Begin each succeeding table with these three movements.

2. Wg. wlk. *b* st. arch flex.
3. Over gr. hang. oscillation.
4. Wg. st. L. elev. backw.
5. St. 2 A. ext. to yd. *d*.
6. March. and run.
7. Wg. forw. ly. pos.
8. Stoopfall. pos.
9. Wg. wlk. *a* st. rev. T. rot.
10. Wg. turn std. st. sidew. flex.
11. Wg. st. alt. toe elev.
12. Hor. serp., head first (hor. ladder).
13. Upw. jump.
14. St. 2 A. elev. forw. upw.

VI.

1. Yd. *c* std. st. pos.
2 A. ext. backw. and upw.
Wg. std. st. 2 Kn. flex.
2. Wg. wlk. *b* st. arch flex.
3. Walking upw. on stallbars.
4. Wg. courtesy st. H. rot.
5. Bend st. alt. A. ext. to Yd. *d*.
6. March. and run.
7. St. 2 A. swim.
8. Wg. Kn. st. backw. flex.
9. Wg. wlk. *b*. st. T. rot.
10. Close st. T. sidew. flex.
11. Wg. st. 2 Heel and toe elev.
12. Over gr. hang. osc. trav.
13. Reach gr. st. introd. to vault.
Wg. toe st. std. jump.
14. St. 2 A. elev. sidew. upw.
Yd. *a* st. 2 A. flg.

VII.

1. Yd. *c* wlk. *b* st. pos.
Bend st. alt. A. ext. upw.
Prep. to jump.
2. Wg. close st. arch flex.
3. Arch hang. on stallbars.
4. Wg. cr. *a* ½ st. pos.
5. 2 A. ext. sidew. and backw.
6. March. and run.
7. Yd. *c* stoop st. H. rot.
8. Stoopfall. F. pl. forw. and backw.
9. Wg. turn std. st. backw. flex.
10. Wg. wlk. *c* st. sidew. flex.
11. Wg. wlk. *d* st. 2 Heel elev.
12. Hor. serpentine, feet first (hor. ladder).
13. ½ yd. gr. st. introd. to vault.
Forw. jump.
14. Yd. *c* st. 2 A. circ.

VIII.

1. Yd. *c* wlk. *a* st. pos.
Wg. courtesy st. H. rot.
2 A. ext. forw., backw. and upw.
2. Wg. sup. std. st. arch flex.
3. Sidew. run. on stallbars.
4. Wg. wlk. *b* st. 2 Kn. flex.
5. Rch. st. 2 A. flg. sidew.
6. March. and run.
7. Wg. forw. ly. pos.
8. Rest ly. alt. L. elev.
9. Wg. wlk. *c* st. T. rot.
10. Wg. turn wlk. *a* st. sidew. flex.
11. Yd. *c* st. 2 Heel elev.
12. Fallhang. 2 A. flex.
13. Vault. bench face down.
Wg. courtesy sitt. hopping forw.
14. Bend st. 2 A. ext. to Yd. *d*.

IX.

1. Wg. wlk. *b* st. 2 Kn. flex.
Bend st. alt. A. ext. to Yd. *d*.
Prep. to jump.
2. Wg. sup. std. st. arch flex.
3. Introd. to cr. hang.
4. Wg. cr. *a* ½ st. F. flex. and ext.
5. ½ str. yd. *c* st. pos.
6. March. and run.
7. Wg. forw. ly. H. rot.
8. Wg. Kn. st. backw. flex.
9. Wg. ride sitt. T. rot.
10. Wg. F. side gr. st. sidew. flex.
11. Wg. close toe st. slow march.
12. Fallhang. sagittal trav.
13. Skip between benches (like pommel vault).
90° upw. jump.
14. St. 2 A. elev. sidew. w. 2 Heel elev.

X.

1. Str. std. st. pos.
Wg. st. slow 2 Kn. flex.
St. 2 A. ext. to Yd. *d*.
2. Wg. st. arch flex.
3. Change legs on oblique rope.
4. Wg. std. courtesy st. H. rot.
5. ½ str. reach pos.
6. March. and run.
7. Rch. st. 2 A. flg. sidew.
8. Rest ly. alt. L. elev.
9. Wg. Kn. st. T. rot.
10. Wg. turn st. sidew. flex.
11. Yd. *c* std. st. 2 Heel elev.
12. Cr. *a* hang. pos.
13. Vault bench face down.
Jump from bench, ½ start.
Wg. toe st. hopping.
14. Yd. *d* st. 2 A. elev.
Yd. *a* st. 2 A. flg.

XI.

1. 90° facing and side step.
2 A. ext. forw. sidew. and upw.
Wg. st. 2 Heel and toe elev.

2. Wg. st. arch flex.
3. Hor. trav. on stallbars (2 counts).
4. Wg. cr. *a* ½ st. Kn. ext. backw.
5. St. 2 A. flg. upw.
6. March. and run.
7. ½ yd. *c* rch. pos.
8. Stoopfall. H. rot.
9. Yd. *c* close st. T. rot.
10. ½ str. wg. std. st. sidew. flex.
11. Yd. *c* close st. 2 Heel elev.
12. 2 gr. hang. osc. trav.
13. Inside pommel vault (saddles). Sidew. jump.
14. Yd. *a* st. 2 A. flg. and F. pl. forw.

XII.

1. Str. wlk. *b* st. pos. ½ str. yd. *c* pos. Yd. *c* st. 2 Heel elev.
2. Wg. std. st. arch flex.
3. Diagonal serpentine; hor. ladder.
4. Wg. std. courtesy sitt. pos.
5. Rch. st. 2 A. flg. upw.
6. March. and run.
7. Wg. forw. ly. H. rot.
8. Wg. F. gr. sitt. slight T. backw. flex.
9. Yd. *c* std. st. T. rot.
10. ½ str. wg. st. sidew. flex.
11. Yd. *c* st. alt. toe elev.
12. Fallhang. transverse trav.
13. St. face-vault over low. bar. Jump from bench, whole start. 2 A. flg. upw. jump.
14. Yd. *d* st. 2 A. elev. and 2 Heel elev. Yd. *a* st. 2 A. flg.

XIII.

1. 90° facing and front step. 2 A. ext. sidew. backw. and upw. Wg. courtesy sitt. pos.
2. Wg. std. st. arch flex.
3. Vert. trav. on stallbars.
4. Wg. st. L. elev. sidew.
5. ½ str. Yd. *c* (rch.) pos.
6. March. and run.
7. Yd. *a* stoop st. 2 A. flg.
8. Str. gr. ly. exc. 2 L. elev.
9. Yd. *c* turn wlk. *a* st. backw. flex.
10. ½ str. wg. close st. sidew. flex.
11. Yd. *c* wlk. *a* st. 2 Heel elev.
12. Spiral serp., vertical ladder.
13. Back vault through double bar. 2 A. and L. flg. upw. jump.
14. Turn close st. 2 A elev. sidew.

XIV.

1. Str. wlk. *a* st. pos. Wg. wlk. *b* st. 2 Kn. flex. 2 A. ext. forw., sidew., backw., and upw.
2. Yd. *c* sup. st. arch flex.
3. (Fallhang to) arch hang. on vert. ropes.
4. Wg. toe st. 2 Kn. flex. to sitt.
5. Rch. st. 2 A. flg. sidew.
6. March. and run.
7. Yd. *c* stoop st. 2 A. circ.
8. Wg. F. gr. sitt. T. backw. flex. (to the floor).
9. Yd. *c* wlk. *b* st. T. rot.
10. Wg. side fall. pos.
11. Yd. *c* wlk. *b* st. 2 Heel elev.
12. 2 Cr. *a* hang. pos.
13. Face-vault on bench. 1 step's start forw. jump.
14. St. 2 A. elev. forw. upw.

XV.

1. 180° facing and side step. ½ str. rch. pos. Wg. std. st. slow 2 Kn. flex. 2 A. ext. in various directions.
2. Yd. *c* wlk. *b* st. arch flex.
3. Trav. on oblique rope.
4. Wg. wlk. *d* st. 2 Kn. flex.
5. St. alt. A. flg. forw. upw.
6. March. and run.
7. Wg. stoop st. 2 A. swim.
8. Str. gr. ly. exc. 2 L. elev.
9. Yd. *c* turn std. st. 2 A. ext. sidew.
10. ½ str. wg. wlk. *b* st. sidew. flex.
11. Wg. close toe st. slow march.
12. Spiral serp., vert. ladder.
13. Rch. gr. st. introd. to vault. Jump from ½ start and 90° turn. Yd. *c* toe st. hopping.
14. Yd. *a* st. 2 A. flg. and F. pl. forw.

XVI.

1. Str. wlk. *b* st. pos. Wg. cr. *a* ½ st. pos. 2 A. ext. in var. dir.
2. Yd. *c* sup. st. arch flex.
3. Fallhang. vert. trav. (ropes).
4. Wg. toe st. alt. Kn. upw. flex. Yd. *c* st. 2 Kn. flex.
5. Rch. st. 2 A. flg. upw.
6. March. and run.
7. Stoop st. 2 A. ext. sidew. and backw.
8. Wg. F. gr. sitt. T. backw. flex.
9. Yd. *c* wlk. *c* st. T. rot.
10. ½ str. turn std. st. sidew. flex.
11. Yd. *c* st. 2 Heel. and toe elev.
12. Stoophang. pos. on stallbars.
13. Face-vault over low box. St. jump over rope.
14. Yd. *a* turn close st. 2 A. flg.

XVII.

1. 180° facing and front step. Wg. std. st. slow 2 Kn. flex. 2 A. ext. in. var. dir.
2. Yd. *c* wlk. *b* st. arch flex.
3. Bal. hang. sidew. trav.
4. Yd. *c* st. L. elev. backw.
5. Bend stoop. st. 2 A. ext. to yd. *d*.
6. March. and run.
7. ½ str. wg. st. T. forw. flex.
8. Wg. F. gr. ½ st. backw. flex.
9. Yd. *c* Kn. st. T. rot.
10. Wg. F. side gr. st. sidew. flex.
11. Yd. *c* wlk. *c* st. 2 Heel elev.
12. Climb. vert. ropes.
13. Somersault over low bar. Jump from bench, whole start. Wg. toe ½ st. hopg.
14. Yd. *c* st. 2 A. circ.

XVIII.

1. Str. std. st. pos. Wg. wlk. *d* st. 2 Kn. flex. ½ yd. *c* reach pos.
2. Yd. *c* sup. st. arch flex.
3. Arch-hang. on hor. bar.
4. Wg. courtesy st. 2 A. ext. sidew.
5. Bend stoop st. alt. A. ext. to Yd. *d*.
6. March. and run.
7. Yd. *c* forw. ly. pos.
8. Hor. stoopfall. pos.
9. Yd. *c* turn std. st. backw. flex.
10. ½ str. turn close st. sidew. flex.
11. Rest st. 2 Heel elev.
12. Diag. serp., vert. ladder.
13. Leapfrog on to box. 180° upw. jump.
14. Yd. *a* turn std. st. 2 A. flg.

XIX.

1. Yd. *c* wlk. *d* st. pos. Rest st. 2 Heel elev. Turn std. st. 2 A. ext. sidew.
2. Yd. *c* st. arch flex.
3. Bend fallhang. sidew. trav.
4. Yd. *c* wlk. *b* st. 2 Kn. flex.
5. ½ str. backw. reach pos.
6. March. and run.
7. Bend stoop st. alt. A. ext. upw.
8. Yd. *c* Kn. st. backw. flex.
9. Yd. *c* ride sitt. T. rot.
10. Wg. side fall. pos.
11. Yd. *c* close toe st. slow march.
12. 2 Cr. *a* hang. alt. Kn. ext.
13. Inside pommel vault (saddle). 2 steps' start forw. jump.
14. St. 2 A. elev. sidew. w. 2 Heel elev.

XX.

1. Str. wlk. *b* st. pos. Wg. st. slow 2 Kn. flex. Turn st. 2 A. ext. sidew.
2. Yd. *c* sup. std. st. arch flex.
3. Bend und. gr. hang. pos.
4. Yd. *a* courtesy st. 2 A. flg.
5. Yd. *b* st. 2 A. flg.
6. March. and run.
7. Str. st. T. forw. flex.
8. Wg. F. gr. ½ st. backw. flex.
9. Rest close st. T. rot.
10. ½ str. turn wlk. *a* st. sidew. flex.
11. Rest wlk. *b* st. 2 Heel elev.
12. Hor. serp., head first (hor. ladder).
13. Back-vault through double-bar. 1 step's start jump over rope.
14. Yd. *d* turn std. st. 2 A. elev.

XXI.

1. Str. wlk. *a* st. pos. Rest stride st. 2 Heel elev. Turn close st. 2 A. ext. to ½ str. yd. *c*.
2. Yd. *c* st. arch flex.
3. Zigzag serp., vert. ladder.
4. Wg. fallout. *a* pos.
5. Yd. *b* st. 2 A. flg.
6. March. and run.
7. Str. stoop st. 2 A. ext. upw.
8. Rest ly. exc. 2 L. elev.
9. Rest std. st. T. rot.
10. Wg. side fall. L. elev.
11. Yd. *c* close toe st. slow march.
12. Arch-hang. pos. on hor. bar.
13. Leapfrog on to box. 3 steps' start forw. jump.
14. Yd. *c* turn close st. 2 A. circ.

XXII.

1. Bend st. 2 A. ext. sidew. and 2 Heel elev. Wg. toe st. alt. Kn. upw. flex. ½ yd. *c* reach pos.
2. Yd. *c* std. st. arch flex.
3. Climb poles.
4. Yd. *c* std. st. 2 Kn. flex.
5. Yd. *c* st. 2 A. flg. forw.
6. March. and run.
7. Bend stoop st. 2 A. ext. upw.
8. Yd. *c* F. gr. sitt. backw. flex.
9. Rest wlk. *a* st. T. rot.
10. ½ str. wg. turn st. sidew. flex.
11. Wg. fallout. *a* pos.
12. Cr. hang. alt. L. elev.
13. Cr. hang. jump from stallbars. Face-vault over bench. Yd. *c* toe ½ st. hopg.
14. Yd. *d* st. 2 A. elev. and 2 Heel elev. Yd. *a* st. 2 A. flg.

XXIII.

1. Rest wlk. *b* st. 2 Heel elev. / Yd. *c* st. slow 2 Kn. flex. / 2 A. ext. in var. dir.
2. Yd. *c* std. st. arch flex.
3. Bend und. gr. hang pos.
4. Wg. fallout *b* pos. (backw.).
5. Reach st. 2 A. flg. upw.
6. March. and run.
7. Yd. *c* forw. ly. H. rot.
8. Stoopfall. alt. L. elev.
9. Rest. wlk. *b* st. T. rot.
10. Wg. side fall. L. elev.
11. Yd. *c* close toe st. slow march.
12. Trav. on oblique repe.
13. Vault through 2-bar, hands on upper bar. / Wg. std. st. jump, heels strike.
14. St. 2 A. elev. forw. upw. and 2 Heel elev.

XXIV.

1. Str. st. 2 Heel elev. / Yd. *c* std. st. slow 2 Kn. flex. / 2 A. ext. in var. dir.
2. ½ str. wg. wlk. *b* arch flex.
3. Und. gr. hang. osc. trav.
4. Yd. *c* cr. *a* ½ st. pos.
5. Str. stoop st. 2 A. flg. upw.
6. March. and run.
7. Yd. *a* forw. ly. 2 A. flg.
8. Yd. *c* F. gr. sitt. backw. flex.
9. Rest. Kn. st. T. rot.
10. Rest. std. st. sidew. flex.
11. Wg. fallout. *b* pos. (forw.).
12. Climb. from rope to rope.
13. Str. gr. ½ st. jump from stallbars. / Twice upw. jump.
14. Yd. *a* st. 2 A. flg. and F. pl. forw.

XXV.

1. Str. std. st. 2 Heel elev. / Wg. wlk. *d* st. 2 Kn. flex. / 2 A. ext. in. var. dir.
2. ½ str. wg. wlk. *b* st. arch flex.
3. Climb vert. ropes.
4. Yd. *c* toe st. 2 Kn. flex. to sitt.
5. Reach stoop st. 2 A. flg. upw.
6. March. and run.
7. Rest forw. ly. pos.
8. Str. gr. ly. slight 2 L. elev.
9. Str. close st. T. rot.
10. ½ str. wg. F. side gr. st. sidew. flex.
11. Wg. fallout *a* pos. (backw.).
12. Diag. serp., come down head first; hor. ladder.
13. Face-vault over low box. / Run. jump over rope. / 180° upw. jump.
14. St. 2 A. elev. sidew. and 2 Kn. flex.

GROUP No. 2.[1]

TWENTY-FIVE tables for a class of women nineteen to twenty-five years of age, who have had some previous training.

I.

1. Close st. pos. / Wg. st. H. flex. backw. / Wg. stride st. 2 Heel elev. / St. 2 A. ext. upw.; also sidew. / Close st. 2 Heel elev.
2. Wg. st. arch flex.
3. Fallhang. pos.
4. Wg. st. 2 Kn. flex.
5. ½ str. st. pos.
6. Marching.
7. Yd. *c* st. 2 A. circ.
8. Str. gr. ly. exc. L. elev.
9. Wg. close st. T. rot.
10. Wg. std. st. sidew. flex.
11. Wg. st. alt. toe elev.
12. Sidew. running on stallbars.
13. Prep. to jump.
14. Yd. *a* st. 2 A. flg.

II.

1. Wg. wlk. *a* (*b*. *c*, *d*,) pos. / St. 2 A. ext. forw.; also sidew. and upw. / Prep. to jump.
2. Wg. std. st. arch flex.
3. Wlk. up stallbars.
4. Wg. std. st. 2 Kn. flex.
5. St. A. flg. to ½ str. pos.
6. March. and run.
7. Wg. forw. ly. pos.
8. Stoopfall. pos.
9. Wg. std. st. T. rot.
10. Close st. sidew. flex.
11. Wg. wlk. *b* st. 2 Kn. flex.
12. Ov. gr. hang. pos.
13. Upw. jump.
14. St. 2 A. elev. sidew.

[1] In this group an attempt has been made to illustrate how, within the legitimate domain of educational gymnastics, it is possible to make a transition into æsthetical gymnastics. Examples of this are XI. 2; XVI. 1*d* and 14; XX. 2; XXII. 2 and 14; XXIV. 2, 7 and 9; XXV. 2, 4, 7 and 14, etc., etc.

III.

1. Yd. *c* std. st. pos. / Wg. wlk. *a* (*b*, *c*, *d*,) 2 Heel elev. / St. 2 A. ext. backw.; also upw. / Std. st. prep. to jump.
2. Wg. wlk. *b* st. arch flex.
3. Hor. serp., hor. ladder, feet first.
4. Wg. cr. *a* ½ st. pos.
5. Bend st. alt. A. ext. upw. (sidew. or forw.).
6. March. and run.
7. Wg. forw. ly. pos.
8. Wg. Kn. st. T. backw. flex.
9. Wg. wlk. *a* st. T. rot.
10. Wg. wlk. *b*. st. sidew. flex.
11. Wg. st. alt. 2 heel and toe elev.
12. Ov. gr. hang. oscil.; later osc. trav.
13. Forw. jump. / Wg. toe st. std. jump.
14. Yd. *d* st. 2 A. elev.

IV.

1. Yd. *c* wlk. *b* st. pos. / Wg. wlk. *a* st. 2 Kn. flex. / St. 2 A. ext. sidew. and backw. / Prep. to jump.
2. Wg. sup. st. arch flex.
3. Hor. serp., hor. ladder, head first.
4. Wg. cr. *a* ½ st. Kn. ext. backw. (forw.).
5. Rch. st. 2 A. flg. sidew.
6. March. and run.
7. Yd. *c* stoopst. 2 A. rot.
8. Str. ly. L. elev.
9. Wg. turn wlk. *a* st. T. backw. flex.
10. Wg. wlk. *c* st. sidew. flex.
11. Wg. fallout. *a* pos.
12. Double gr. hang. osc. trav.
13. Face vault on bench. / 90° upw. jump. / Wg. courtesy sitt. hop.
14. St. 2 A. elev. forw. upw.

V.

1. Wg. wlk. *d* st. 2 Kn. flex. / St. 2 A ext. to Yd. *d*. / Wg. close st. slow march.
2. Wg. sup. std. st. arch flex.
3. Diag. serp., hor. ladder.
4. Wg. st. L. elev. sidew.
5. St. 2 A. flg. upw.
6. March. and run.
7. Yd. *c* forw. ly. pos.
8. Stoopfall. H. rot.
9. Wg. wlk. *b*. st. T. rot.
10. Wg. turn std. st. sidew. flex.
11. Wg. fallout *b* pos.
12. Introd. to cr. hang. pos.
13. Reach (also ½ yd.) gr. st. introd. to vault. / Sidew. jump. / Wg. toe st. hopg.
14. St. 2 A. elev. sidew. upw.

VI.

1. Yd. *c* wlk. *a* st. pos. / St. 2 A. ext. forw., backw. and upw. / Wg. std. st. 2 Kn. flex. / St. 2 A. swim.
2. Yd. *c* wlk. *b* st. arch flex.
3. Arch hang. on upper stallbar.
4. Bal. wlk. on low hor. bar. / Wg. toe st. 2 Kn. flex. to sitt.
5. ½ str. yd. *c* pos.
6. March. and run.
7. Yd. *a* fallout *b* 2 A. flg.
8. Str. ly. exc. 2 L. elev.
9. Wg. turn std. st. T. backw. flex.
10. Wg. F. side gr. ½ st. sidew. flex.
11. Wg. fallout *c* pos.
12. Change leg on oblique rope.
13. Backvault through 2-bar. / St. jump. ov. rope. / Wg. crtsy. sit. sidew. hopg.
14. St. 2 A. elev. sidew. and 2 Heel elev.

VII.

1. Yd. *c* wlk. *b* st. pos. / St. 2 A. flg. upw. / Wg. fallout *d* pos. / ½ str. rch. st. pos.
2. Yd. *c* sup. st. arch flex.
3. Diag. serp., hor. ladder.
4. Wg. cr. *a* ½ st. Kn. abd.
5. ½ str. wg. std. st. T. forw. flex.
6. March. and run.
7. Yd. *c* fallout *b* 2 A. rot.
8. Wg. ½ Kn. st. T. backw. flex.
9. Wg. wlk. *c* st. T. rot. (also rev. rot.).
10. Wg. turn wlk. *a* st. sidew. flex.
11. Yd. *c* St. 2 Kn. flex.
12. Fallhang. 2 A. flex.
13. Somersault ov. bar (hip-high). / 2 A. flg. upw. jump. / 1 step's start forw. jump.
14. Yd. *d* st. 2 A. elev. and 2 Heel elev.

VIII.

1. Wg. wlk. *d* st 2 Kn. flex. / St. 2 A. ext. forw., sidew., backw., and upw. / ½ yd. *c* rch. st. pos. / Wg. fallout *a* backw.
2. Yd. *c* st. arch flex.
3. Fallhang. transv. trav.
4. Yd. *c* toe std. st. 2 Kn. flex. to sitt.
5. Wg. forw. ly. H. rot.

6. March. and run.
7. Bend fallout *b* alt. A. ext. upw.
8. Wg. F. gr. sitt. T. backw. flex.
9. Yd. *c* st. T. rot.
10. ½ str. wg. std. st. T. sidew. flex.
11. Wg. heel sup. wlk. *b* st. T. forw. flex.
12. Arch hang. pos. (bar shoulder-high).
13. Inside pommel vault on saddles. Rung. high jump. Yd. *c* toe st. hopg.
14. St. 2 A. elev. forw. upw. and 2 Heel elev.

IX.

1. Wg. std. st. 2 Heel elev. in series. St. 2 A. ext. sidew. — "Stárt!" Wg. fallout *b* forw.
2. Yd. *c* sup. std. st. arch flex.
3. Oblique rope climb.
4. Yd. *c* cr. *a* ½ st. Kn. ext. backw.
5. Yd. *c* stp. st. 2 A. circ.
6. March. and run.
7. Bd. fallout *b* 2 A. ext. upw.
8. Str. ly. 2 L. elev.
9. Yd. *c* std. st. T. rot.
10. ½ str. wg. close st. sidew. flex.
11. Yd. *c* crtsy. sitt. pos.
12. Und. gr. hg. osc. trav.
13. Face vault through 2-bar. 2 A. and L flg. upw. jump.
14. Yd. *a* st. 2 A. flg. and F. pl. forw.

X.

1. St. 2 A. ext. upw. — "Stárt!" Wg. st. L. elev. backw. ½ str. yd. *c* pos. Wg. fallout *a* change forw.
2. Yd. *c* std. st. arch flex.
3. Spiral serp., vert. ladder.
4. Rest. st. L. elev. sidew.
5. Rch. st. 2 A. flg. upw.
6. March. and run.
7. Yd. *c* fallout *b* 2 A. rot.
8. Wg. F. gr. ½ st. T. backw. flex.
9. Yd. *c* wlk. *a* st. T. rot.
10. ½ str. wg. wlk. *b*. st. sidew. flex.
11. ½ wg. yd. gr. hor. ½ st. Kn. flex.
12. Cr. *a* hg. pos.
13. Face-vault ov. low box. 180° upw. jump. Wg. toe ½ st. hopg.
14. Yd. *a* turn close st. 2 A. flg.

XI.

1. Wg. wlk. *a* st. 2 Heel elev. in ser. St. 2 A ext. sidew. and upw. — "Stárt!" Wg. fallout *c* backw.
2. ½ str. wg. wlk. *b* st. arch flex.
3. Oblique rope climb.
4. Yd. *c* toe st. alt. Kn. upw. flex.
5. Bd. stp. st. 2 A. ext. sidew. and backw.
6. March. and run.
7. Str. fallout *b* 2 A. elev. (exc.).
8. Hor. stoopfall. pos.
9. Yd. *c* wlk. *c* T. rot. (also rev. rot.).
10. Wg. side fall. pos.
11. Yd. *c* close toe st. slow march.
12. Ov. gr. hg. sidew. trav. (without oscil.).
13. St. face-vault ov. low bar. Run. high jump and turn 90°. Yd. *c* toe ½ st. hpg.
14. Yd. *c* turn close st. 2 A. circ.

XII.

1. Wg. st. ½ step forw. ½ str. rch. st. pos. Yd. *c* std. st. slow 2 Kn. flex. Rch. st. 2 A. flg. sidew.
2. ½ str. wg. sup. st. arch flex.
3. Fallhang. sag. trav.
4. Bal. wlk. on hor. bar., knee-high. Wg. hor. ½ st. pos.
5. Bd. stp. st. alt. A. ext. upw.
6. March. and run.
7. Str. / Rch. } fallout *b* 2 A. flg.
8. Yd. *c* Kn. st. backw. flex.
9. Rest close st. T. rot.
10. ½ str. wg. turn std. st. sidew. flex.
11. Wg. fallout *a* heel elev.
12. Climb poles (ropes).
13. Vault 2-bar, face forw. (downw.). Wg. std. toe st. jump., heels strike.
14. St. 2 A. elev. sidew. and 2 Kn. flex.

XIII.

1. Wg. wlk. *b* 2 Heel elev. in ser. Turn close st. 2 A. ext. sidew. Rch. st. 2 A. flg. upw. Wg. fallout *a* change backw.
2. ½ str. wg. st. arch flex.
3. Diag. serp., vert. ladder.
4. Str. st. L. elev. sidew.
5. Yd. *a* forw. ly. 2 A flg.
6. March. and run.
7. Yd. *d* fallout *b* 2 A. elev.
8. Rest ly. 2 L. elev.
9. Rest std. st. T. rot.
10. ½ str. gr. sidefall. L. elev.
11. Rest close toe st. slow march.
12. 2 Cr. *a* hg. pos.
13. Vault bar. with rope. Twice upw. jump.
14. Yd. *d* st. 2 A. elev. and 2 Kn. flex. Yd. *a* st. 2 A. flg. and F. pl. forw.

XIV.

1. Turn std. st. 2 A. ext. upw. / Yd. *c* std. st. 2 Kn. flex. / ½ str. backw. rch. pos.
2. ½ str. wg. sup. std. st. arch flex.
3. Bal. hg. sidew. trav.
4. Rest cr. *a* ½ st. Kn. ext. backw.
5. Yd. *c* forw. ly. 2 A. rot.
6. March. and run.
7. Yd. *a* fallout *d* 2 A. flg.
8. Yd. *c* F. gr. sitt. T. backw. flex.
9. Rest wlk. *a* st. T. rot.
10. ½ str. wg. close st. sidew. flex.
11. Wg. fallout *c* heel elev.
12. Vert. rope climb.
13. Leap-frog on buck (box). / Sidew. jump. ov. mark. / Yd. *c* toe ½ st. hopg.
14. Yd. *a* arch st. 2 A. flg.

XV.

1. Wg. wlk. *d* st. 2 Heel elev. in ser. / Yd. *a* stoop st. 2 A. flg. / Turn wlk. *a* st. 2 A. ext. upw. / Bd. toe st. 2 A. ext. sidew. and 2 Kn. flex.
2. ½ str. wg. std. st. arch flex.
3. Zigzag serp., vert. ladder.
4. Yd. *d* st. 2 A. elev. sidew. and L. elev. sidew.
5. Bnd. stp. st. 2 A. ext. upw.
6. March. and run.
7. Yd. *c* fallout *c* 2 A. rot.
8. Stoopfall. att. L. elev.
9. Rest wlk. *c* st. (rev.) rot.
10. ½ str. wg. F. side gr. st. sidew. flex.
11. Yd. *c* std. st. 2 Kn. flex.
12. 2 Cr. *a* hg. alt. Kn. ext.
13. Back-vault ov. bar. from one foot. / 90° Twice upw. jump.
14. St. 2 A. elev. sidew. upw. and 2 Kn. flex. / Yd. *a* turn std. st. 2 A. flg.

XVI.

1. Str. std. st. pos. / ½ yd. *c* rch. st. pos. / Turn st. 2 A. ext. backw. and upw. / Wg. st. ½ step forw.
2. Bnd. arch sup. st. 2 A ext. sidew.
3. Bend fallhg. sidew. trav.
4. Str. toe (std.) st. 2 Kn. flex. to sitt.
5. Yd. *c* forw. ly. 2 A. rot.
6. March. and run.
7. Yd. *d* fallout *d* 2 A. elev.
8. Yd. *c* F. gr. sitt. T. backw. flex.
9. Str. close st. T. rot.
10. Rest. std. st. sidew. flex.
11. ½ str. yd. gr. hor. ½ st. Kn. flex.
12. Oblique rope climb.
13. Cr. hang. vault through 2-bar. / Run. long. jump. / Twice sidew. jump.
14. Yd. *a* st. 2 A. flg. and ½ step forw.

XVII.

1. Bend st. alt. A. ext. to yd. *d*. / Wg. std. st. 2 Kn. flex. in ser. / Rch. st. 2 A. flg. upw. / Wg. st. ½ step sidew. forw.
2. Bend arch sup. std. st. 2 A. ext. sidew.
3. Diag. serp., vert. ladder.
4. Bend st. 2 A. ext. upw. and L. elev. sidew.
5. Rest forw. ly. pos.
6. March. and run.
7. Bend F. gr. fallout alt. A. ext. upw.
8. ½ str. wg. Kn. st. T. backw. flex.
9. Str. std. st. T. rot.
10. Rest close st. sidew. flex.
11. ½ yd. gr. cr. *b* ½ st. Kn. flex.
12. Vert. rope climb.
13. Face vault on box. / 2 A. flg. twice upw. jump.
14. Yd. *a* turn std. st. 2 A. flg. / St. 2 A. elev. sidew. and 2 Kn. flex.

XVIII.

1. Str. wlk. *a* st. pos. / St. 2 A. ext. forw. sidew. and upw. —"Start!" / St. alt. A. flg. upw. / Bend toe st. 2 A. ext. upw. and 2 Kn. flex.
2. Wlk. *b* st. A. elev. forw. upw. and T. backw. flex.
3. Arch hang. from fallhg. on bar.
4. Bal. wlk. on bar hip-high. / ½ str. hor. ½ st. pos.
5. Bend stoop st. alt. A. ext. to Yd. *d*.
6. March. and run.
7. Str. F. gr. fallout 2 A. flg. (exc.).
8. Str. ly. 2 L. elev.
9. ½ str. rev. turn fallout. *a* pos.
10. Rest wlk. *b* (*c*) st. sidew. flex.
11. Wg. fallout *c* change forw.
12. 2 Cr. *a* hang. alt. Kn. ext.
13. Backvault through 2-bar (bars nearer than in VI. 13). / Yd. *c* toe st. quick alt. L. elev. sidew.
14. Yd. *c* turn close st. 2 A. circ. / St. 2 A. elev. forw. upw. and 2 Heel elev.

XIX.

1. Wg. wlk. *b* st. 2 Kn. flex. in ser.
   Rch. stoop st. 2 A. flg. sidew.
   Yd. *c* wlk. *d* st. 2 Kn. flex.
   Turn std. st. 2 A. ext. sidew., backw., and upw.
2. Str. wlk. *b* st. arch flex.
3. Spiral serp., vert. ladder.
4. Str. cr. *a* ½ st. pos.
5. Rest forw. ly. pos.
6. March. and run.
7. Str. turn fallout *a* 2 A. ext. upw.
8. ½ str. F. gr. sitt. T. backw. flex.
9. Str. wlk. *a* st. T. rot.
10. Rest turn std. st. sidew. flex.
11. Str. st. 2 Kn. flex.
12. Bend und. gr. hg. pos.
13. Side vault on box to sit in saddle (½ Start).
    180° twice upw. jump.
14. Yd. *d* st. 2 A. and Heel elev.
    Yd. *a* st. 2 A. flg. w. ½ step forw.

XX.

1. Yd. *c* turn std. st. pos.
   St. 2 A. ext. forw., backw., and upw. — "Start!"
   Stoop st. 2 A. ext. to ½ str. yd. *c*.
   Wg. toe st. alt. Kn. upw. flex.
2. St. A. elev. with T. backw. flex.
3. Arch hang. 2 A flex.
4. Yd. *c* st. L. elev. sidew.
5. ½ str. forw. ly. pos.
6. March. and run.
7. Str. turn fallout *a* 2 A. flg. (exc.).
8. Incl. stoopfall. pos.
9. Yd. *c* std. st. quick T. rot.
10. ½ str. gr. side fall L. elev.
11. Yd. *d*. crtsy. sitt. 2 A. elev.
12. Vert. rope climb, from rope to rope.
13. 180° face vault ov. bar.
    2 A. and L. flg. twice upw. jump.
14. Yd. *d* turn std. st. 2 A. elev.
    Yd. *a* arch st. 2 A. flg.

XXI.

1. Str. turn std. st. pos.
   Wg. wlk. *d* st. 2 Kn. flex. in ser.
   Yd. c stp. st. 2 A. rot.
   ½ str. yd. *c*, etc., pos.
2. Str. sup. std. st. arch flex., alternating with
   Gr. arch std. st. pos.
3. Oblique rope trav.
4. Str. cr. *a* ½ st. Kn. abd.
5. Yd. *c* stp. st. 2 A. circ.
6. March. and run.
7. Str. turn fallout *a* 2 A. elev. (exc.).
8. ½ str. wg. F. gr. ½ st. T. backw. flex.
9. Str. wlk. *b* st. T. rot.
10. Rest turn wlk. *a* st. sidew. flex.
11. Str. close toe st. slow march.
12. Bend ov. gr. hg. pos.
13. Vault bar with rope (high).
    360° upw. jump,
14. Turn st. 2 A. elev. forw. upw.
    Yd. *d* st. 2 A. elev. and 2 Kn. flex.

XXII.

1. Str. turn wlk. *a* st. pos.
   Yd. *c* stp. st. 2 A. circ.
   St. slow. 2 A. ext. upw.
   Wg. fallout *a* change backw.
2. St. 2. A. elev. forw. upw., F. pl. forw. and arch flex.
3. Stoophang pos., followed by
   Sidew. jumping on stallbars.
4. St. 2 A. elev. sidew. w. L. elev. sidew.
5. Str. stp. st. 2 A. ext. sidew. and upw.
6. March. and run.
7. Rch. turn fallout *a* 2 A. flg. upw.
8. Rest Kn. st. T. backw. flex.
9. Str. wlk. *c* st. (rev.) T. rot.
10. Rest F. side gr. ½ st. sidew. flex.
11. Rest. st. 2 Kn. flex.
12. Vert. rope climb.
13. Lengthwise backvault to sit in saddle.
    Run. high jump.
    Upw. jump. — "Start!"
14. Yd. *d* fallout *d* 2 A. elev.
    Yd. *a* st. 2 A. flg. w. ½ step forw.

XXIII.

1. Turn std. st. 2 A. ext. sidew. backw. and upw.
   ½ str. rev. turn fallout *a* pos.
   Bend stp. st. 2 A. ext. sidew. and upw.
   Rest std. st. slow 2 Kn. flex.
2. Str. st. arch flex., alternating with
   Gr. arch st. 2 Heel elev.
3. Outside spir. serp., vert. ladder.
4. Yd. *c* st. L. elev. sidew., w. heel elev.
5. Yd. *b* st. 2 A. flg.
6. March. and run.
7. Bend turn fallout *a* slow 2 A. ext. upw.
8. Rest F. gr. sitt. T. backw. flex.
9. Str. Kn. st. T. rot.
10. ½ str. side fall. pos. (later L. elev.).
11. Wg. fallout *c* change backw.
12. 2 Cr. *a* hang. 2 Kn. ext.
13. Sidevault 180° ov. bar (½ start).
    Forw. jump. — "Start!"
14. Yd. *a* turn toe sup. wlk. *a* st. 2 A. flg.

XXIV.

1. Wg. wlk. *a* (*b*) st. 2 Kn. flex. in ser.
   2 A. ext. in var. dir.
   Rch. st. 2 A. flg. upw.
   Yd. *c* toe st. alt. Kn. upw. flex.
2. Wlk. *b* st. 2 A. elev. forw. upw. w. arch flex.
3. Cr. hg. somersault betw. ropes.
4. Bal. wlk. on hor. bar, hip-high.
   Str. wlk. *d* st. 2 Kn. flex.
5. Bend forw. ly. alt. A. ext. upw.
6. March. and run.
7. 2 A. flg. upw. and fallout *d* backw.
8. Rest F. gr. ½ st. T. backw. flex.
9. ½ str. rev. turn fall out *a* zigzag forw.
10. Yd. *c* std. st. sidew. flex.
11. Rest wlk. *b* st. 2 Kn. flex.
12. Bend 2-gr. hg. pos.
13. Face-vault on box.
    90° upw. jump. — "Start!"
14. Yd. *a* turn fallout *a* 2 A. flg.
    St. 2 A. elev. forw. upw. w. T. rot.

XXV.

1. Bend toe st. 2 A. ext. upw. w. 2 Kn. flex.
   Yd. *b* st. 2 A. flg.
   2 A. ext. in var. dir.
   ½ str. fallout *a* ch. A. w. T. rot.
2. St. 2 A. elev. forw. upw., F. pl. forw. and backw. flex.
3. Climb from rope to rope.
4. Str. hor. ½ st. pos.
5. Rest forw. ly. pos.
6. March. and run.
7. A. flg. forw. upw., fallout *d* forw. and chang forw. *a* in 2 counts. *b* in 1 count.
8. Stoopfall. 2 A. flex.
9. Str. turn wlk. *a*. st. backw. flex.
10. Rest side sup. st. T. sidew. flex. ov. bar w. L. elev.
11. Rest wlk. *a* st. Kn. flex.
12. 2 Cr. *a* hg. 2 Kn. ext.
13. Continuous sidevault over bar.
    Run. high jump.
    180° twice upw. jump.
14. Yd. *a* st. 2 A. flg. T. rot. and ½ step sidew. forw.
    Yd. *d* toe st. 2 A. elev. and 2 Kn. flex

GROUP No. 3.

TWENTY-FIVE tables of exercises for a class of men twenty to thirty years of age, who have had previous training.

I.

1. Wg. pos.
   Close st. and std. st. pos.
   St. 2 A. ext. sidew.
   Wg. st. 2 Heel elev.
   St. 2 A. ext. upw.
   Wg. wlk. *a* st. pos.; later 2 Heel elev.
2. Wg. st. arch flex.
3. Und. / Ov. / Double — gr. hang. pos.
4. Wg. st. 2 Kn. flex.
   Wg. cr. *a* ½ st. pos.
5. ½ str. yd. *c* st., etc. pos.
6. Marching and running.
7. Wg. forw. ly. pos.
8. Stoopfall. pos.
9. Yd. *c* std. st. T. rot.
10. Wg. F. side gr. st. sidew. flex.
11. Wg. st. alt. toe elev.
12. Introd. to cr. hang. pos.
13. Prep. to jump.
14. Yd. *a* st. 2 A. flg.

II.

1. Yd. *a* st. 2 A. flg.
   Wg. wlk. *b* st. pos. and 2 Heel elev.
   ½ str. st. pos.
   Wg. std. st. 2 Kn. flex.
   2 A. ext. forw.; also upw.
   Prep. to jump.
2. ½ str. wg. st. arch flex.
3. Und. gr. hg. 2 A. flex.
4. Rest st. 2 Kn. flex. to sitt.
   Wg. st. L. elev. sidew.
5. Rch. st. 2 A. flg. sidew.
6. March. and run.
7. Yd. *a* forw. ly. 2 A. flg.
8. Str. gr. ly. 2 L. elev.
9. Rest st. T. rot.
10. Wg. side fall. pos.
11. Wg. fallout. *a* pos.
12. Hor. serp., hor. ladder.
13. Rch. gr. / ½ yd. gr. — st. introd. to vault.
    Upw. jump.
    Wg. toe st. std. jump.
14. St. 2 A. elev. sidew.

III.

1. St. 2 A. elev. sidew.
   Wg. wlk. *c* st. pos. and 2 Heel elev.
   ½ str. yd. *c* st. pos.
   Wg. wlk. *b* st. 2 Kn. flex.
   St. 2 A. ext. sidew. and backw.
2. Str. sup. st. arch flex., alternating with
   Gr. arch std. st. 2 Heel elev.
3. Spir. serp., vert. ladder.
4. Rest st. L. elev. backw.
   Str. std. st. 2 Kn. flex.
5. Rch. st. 2 A. flg. upw.
6. March. and run.
7. Bend forw. ly. alt. A. ext. to yd. *d*.
8. Wg. F. gr. sitt. T. backw. flex.
9. Rest wlk. *b* st. T. rot.
10. Rest. std. st. sidew. flex.
11. Wg. fallout *b* pos.
12. Stoophang. pos. on stallbars.
13. Vault 2-bar, face up.
    Forw. jump.
    Wg. crtsy. sitt. hopg.
14. St. 2 A. ext. to yd. *d*.

IV.

1. St. 2 A. ext. to yd. *d*.
   Wg. wlk. *d* st. pos. and 2 Heel elev.
   ½ str. rch. st. pos.
   Yd. *c* st. 2 Kn. flex.
   St. 2 A. ext. backw. and upw.
2. Gr. arch st. 2 Heel elev.
3. Diag. serp., hor. ladder.
4. Str. st. L. elev. sidew.
   Wg. hor. ½ st. pos.
5. Yd. *a* stoopst. 2 A. flg.
6. March. and run.
7. ½ str. fallout *a* pos.
8. Stp. fall. alt. L. elev.
9. Str. close st. T. rot.
10. Rest F. side gr. St. sidew. flex.
11. Wg. close toe st. slow march.
12. Oblique rope climb.
13. Face-vault on box.
    90° upw. jump.
    Sidew. jump.
14. Yd. *d* st. 2 A. elev.

V.

1. Yd. *d* st. 2 A. elev.
   Wg. wlk. *a* (*b*) st. pos. in series.
   Yd. *c* std. st. pos.
   Wg. fallout *d* pos.
   St. 2 A. ext. forw., sidew., and upw.
2. Str. sup. std. st. arch flex.
3. Double / Und. gr. hang. osc. trav.
4. Str. toe (std.) st. 2 Kn. flex. to sitt.
   Balance-walking on hor. bar. (low).
5. Yd. *c* std. st. 2 A. rot.
6. March. and run.
7. Yd. *c* forw. ly. 2 A. circ.
8. ½ str. wg. ½ Kn. st. T. backw. flex.
9. Str. wlk. *a* (*b*) st. T. rot.
10. Str. std. st. sidew. flex.
11. Wg. fallout *c* pos.
12. Climb. vert. ropes.
13. Inside pommel vault on saddles.
    2 A. flg. upw. jump.
    Wg. toe st. hopg.
14. St. 2 A. elev. forw. upw.

VI.

1. St. 2 A. elev. forw. upw.
   Wg. wlk. *c* (*d*) st. pos. in ser.
   ½ yd. *c* rch. st. pos.
   Bend toe st. 2 A. ext. upw. w. 2 Kn. flex.
   St. 2 A. ext. forw., sidew., and backw.
2. Gr. arch st. Kn. upw. flex.
3. Diag. serp. on vert. ladder.
4. Str. wlk. *a* st. 2 Kn. flex.
   Rest cr. *a* ½ st. pos.
5. Rch. stp. std. st. 2 A. flg. sidew.
6. March. and run.
7. ½ str. fallout *b* pos.
8. Hor. stp. fall. L. elev.
9. Str. std. st. T. rot.
10. Str. wlk. *b* st. sidew. flex.
11. Wg. instep gr. st. Kn. flex.
12. Oblique rope climb.
13. Face-vault over bar.
    1 step's start forw. jump.
    Wg. toe ½ st. hopg.
14. St. 2 A. elev. sidew. w. 2 Heel elev.

VII.

1. Wg. wlk. *a* st. 2 Heel elev. in ser.
   Yd. *c* turn close st. 2 A. ext. sidew.
   Bend toe std. st. 2 A. ext. upw. w. 2 Kn. flex.
   St. 2 A. ext. in var. directions.
2. Gr. arch cr. *a* ½ st. Kn. ext. forw.
3. Climb. poles.
4. Rch. crtsy. sitt. L. ext.
   Yd. *d* st. 2 A. elev. w. L. elev. sidew.
5. Bend stoop st. alt. A. ext. upw.
6. March. and run.
7. Yd. *c* forw. ly. 2 A. rot.
8. Rest F. gr. sitt. T. backw. flex.
9. Yd. *c* gr. ride sitt. T. rot.
10. Str. wlk. *c* st. sidew. flex.
11. Wg. heel sup. wlk. *b* st. T. forw. flex.
12. Somersault betw. ropes.
13. Back-vault on box.
    3 steps' start forw. jump.
    Wg. toe std. st. jump., feet strike.
14. Yd. *d* st. 2 A. elev. and 2 Heel elev.
    Yd. *a* st. 2 A. flg. and F. pl. forw.

VIII.

1. St. 2 A. elev. sidew. and 2 Heel elev.
   Wg. wlk. *b* st. 2 Heel elev. in ser.
   ½ str. backw. rch. pos.
   Yd. *c* std. st. slow. 2 Kn. flex.
   St. 2 A. ext.
2. Fallhg. to gr. arch st.
3. Outside serp. on vert. ladder.
4. Rest wlk. *d* st. 2 Kn. flex.
   Bend st. 2 A. ext. upw. w. L. elev. sidew.
5. Wg. stoop std. st. 2 A. ext. to ½ str. yd. *c*.
6. March. and run.
7. Bend F. gr. fallout 2 A. ext. upw.
8. Stoop fall. 2 A. flex.
9. Rest ride sitt. T. rot.
10. Rest st. sidew. flex. ov. bar w. L. elev.
11. Rest close toe st. slow march.
12. Oblique rope climb., feet first.
13. Cr. hang. vault through 2-bar.
    St. jump. over rope.
    2 A. and L. flg. upw. j.
14. St. 2 A. elev. forw., upw., and 2 Heel elev.
    Yd. *a* turn close st. 2 A. flg.

IX.

1. Yd. *d* st. 2 A elev. w. 2 Heel elev.
   Wg. wlk. *c* st. 2 Heel elev. in ser.
   ½ str. rch. pos.
   Yd. *c* wlk. *b* st. 2 Kn. flex.
   2 A ext.
2. Gr. arch st. L. elev. forw.
3. Diag. climb. on vert. ropes.
4. ½ str. wg. hor. ½ st. pos.
   Wg. st. L. elev. sidew. w. heel elev.
5. Bend stp. st. slow 2 A. ext. to Yd *d*.
6. March. and run.
7. Rch. forw. ly. 2 A. flg. sidew.
8. Rest ly. 2 L. swim.
9. ½ str. wg. turn st. backw. flex.
10. Rest turn wlk. *a* st. sidew. flex.
11. Wg. heel gr. ½ st. T. forw. flex.
12. 2 Cr. *a* hang. alt. Kn. ext. forw.
13. Leapfrog on horse.
    Sidew. jump over rope.
    Upw. jump.—"Stárt!"
14. Turn close st. 2 A. elev. sidew.
    St. 2 A. elev. forw. upw. w. 2 Heel elev.

X.

1. Yd. *a* turn close st. 2 A flg.
   Wg. wlk. *d* st. 2 Heel elev. in ser.
   ½ yd. *c* rch. pos.
   Yd. *c* std. st. 2 Kn. flex.
   2 A ext.
2. Gr. arch st. 2 A. flex.
3. Zigzag vert. serp., vert. ladder.
4. Str. toe st. alt. Kn. upw. flex.
   Bal. wlkg. on hor. bar (hip-high).
5. Str. stp. std. st. 2 A. ext. upw.
6. March. and run.
7. ½ str. rev. turn fallout *a* ch. of A.
8. Yd. *a* fall F. gr. sitt. 2 A. flg.
9. Rest wlk. *c* st. T. rot.
10. ½ str. sidefall. L. elev.
11. Wg. instep gr. ½ st. Kn. flex.
12. Climb poles.
13. Back-vault. ov. bar from one foot and hand; (also w. 180° turn).
    Run. high jump.
    90° upw. jump.
14. Yd. *d* turn close st. 2 A. elev.
    St. 2 A. elev. sidew. w. 2 Kn. flex.

XI.

1. St. 2 A. elev. forw. upw. and 2 Heel elev.
   Rest wlk. *b* st. 2 Heel elev. in ser.
   St. 2 A. ext.
   Yd. *c* wlk. *d* st. 2 Kn. flex.
2. Fallhg. to gr. arch st. (bar low).
3. Bal. hang. sidew. trav.
4. Rest. st. 2 Kn. flex.
   Rch. st. 2 A. flg. upw. w. L. elev. backw.
5. Bend stp. std. st. 2 A. ext. upw.
6. March. and run.
7. Bend forw. ly. slow 2 A. ext. to Yd. *d*.
8. Str. F. gr. sitt. T. backw. flex.
9. Str. turn close st. 2 A. ext. upw.
10. Rest st. sidew. flex. w. L. elev.
11. Wg. fallout *a* heel elev.
12. Oblique rope climb. feet first.
13. 180° face-vault on box.
    Back-vault from one foot on horse to sit in saddle.
    Run. long jump.
    180° upw. jump.—"Stárt!"
14. Yd. *d* st. 2 A. elev. forw. upw.
    Turn close st. 2 A. elev. forw. upw.

XII.

1. Yd. *d* st. 2 A. elev. and 2 Heel elev.
   Rest std. st. 2 Heel elev. in ser.
   St. 2 A. ext. in var. dir.
   Str. wlk. *a* st. 2 Kn. flex.
2. Gr. arch st. hand trav. *a*.
3. Bend und. gr. hang. hor. trav. (bar).
4. Rest wlk. *b* st. 2 Kn. flex.
   Str. st. L. elev. sidew.
5. Bend turn fallout *a* 2 A. ext. upw.
6. March. and run.
7. Rest forw. ly. pos.
8. Stp. fall. alt. A. and L. elev.
9. Str. turn st. 2 A. ext. upw.
10. Yd. *c* st. T. sidew. flex.
11. ½ yd. gr. cr. *b* ½ st. Kn. flex.

12. 2 Cr. *a* hg. alt. Kn. ext.
13. Face-vault on box from one hand and foot.
Forw. jump. — "Start!"
360° upw. jump.
14. Yd. *a* turn std. st. 2 A. flg.
Std. st. 2 A. elev. sidew. w. 2 Kn. flex.

XIII.

1. Std. st. 2 A. elev. sidew. and 2 Kn. flex.
Rest wlk. *a* st. 2 Heel elev. in ser.
2 A. ext.
Str. wlk. *b* st. 2 Kn. flex.
2. Oblique gr. arch st. 2 Heel elev.
3. Bend ov. gr. hg. hor. trav. (bar).
4. Str. close toe st. slow march.
Rest. st. 2 Kn. flex. to sitt.
5. Str. stoop std. st. 2 A. flg. upw.
6. March. and run.
7. Yd. *d* turn fallout *a* 2 A. elev.
8. Bend fall F. gr. sitt. alt. A. ext. upw.
9. Str. turn wlk. *a* st. 2 A. ext. upw.
10. Wg. F. gr. side fall. L. elev.
11. Wg. st. 2 Heel and toe elev.
12. Single rotary trav. on oblique rope.
13. Lengthwise back-vault to sit in saddle.
Vault bar w. rope.
90° twice upw. jump.
Yd. *c.* toe st. hopg.
14. Yd. *d* crtsy. sitt. 2 A. elev.
Yd. *a* arch st. 2 A. flg.

XIV.

1. Yd. *a* arch st. 2 A. flg.
Rest wlk. *c* st. 2 Heel elev. in ser.
2 A. ext. in var. dir. ("Start!")
Str. wlk. *d* st. 2 Kn. flex.
2. Fallhg. to gr. arch st. (bar quite low).
3. Bend 2 gr. hang. hor. trav. ("nose in the groove").
4. Rest. std. st. slow 2 Kn. flex. to sit.
Str. cr. *a* ½ st. F. flex. and ext.
5. Str. turn fallout *a* 2 A. flg. upw.
6. March. and run.
7. Str. forw. ly. pos.
8. Incl. stp. fall. 2 A. flex.
9. Rest turn wlk. *a* st. backw. flex.
10. Rest std. st. quick sidew. flex.
11. ½ str. yd. gr. hor. ½ st. Kn. flex.
12. 2 Cr. *a* hang. 2 Kn. ext.
13. Run. face-vault on bar.
"Sit over" horse, from one hand and foot.
Run. high jump. 90° turn.
Sidew. jump. — "Start!"
14. Turn close st. 2 A. elev. forw. upw.
Yd. *d* st. 2 A. elev. and 2 Kn. flex.

XV.

1. Yd. *d* st. 2 A. elev. and 2 Kn. flex.
Rest wlk. *d* st. 2 Heel elev. in ser.
½ str. yd. etc. pos.
Str. std. st. 2 Kn. flex.
2 A. ext.
2. Gr. arch st. hand trav. *b*.
3. Diag. serp. down H. first (hor. ladder).
4. Rest wlk. *a* st. 2 Kn. flex.
Str. cr. *a* ½ st. Kn. ext. back.
5. Rch. stp. std. st. 2 A. flg. upw.
6. March. and run.
7. Wg. turn fallout *a* slow 2 A. ext. upw.
8. Rest fall F. gr. sitt. T. rot.
9. Str. turn std. st. 2 A. ext. sidew. and upw.
10. Str. turn wlk. *a* st. sidew. flex.
11. Wg. heel gr. ½ st. Kn. flex.
12. Bend 2 gr. hang. vert. trav. (ropes).
13. Vault 2-bar face up (bars quite near).
Jump. from benches (1; 2; later 3).
2 A. flg. upw. jump. — "Start!"
14. Yd. *d* turn std. st. 2 A. elev.
Yd. *a* st. 2 A. flg. and F. pl. forw.

XVI.

1. Yd. *a* st. 2 A. flg. and F. pl. forw.
Wg. std. st. 2 Kn. flex. in ser.
2 A. ext.
Rest. st. slow 2 Kn. flex.
2. Bend arch std. st. 2 A. ext. upw.
3. Bend 2-gr. hg. hor. trav. w. alt. elev.
4. Yd. *c* st. L. elev. sidew.
Bal. wlkg. backw. on hor. bar.
5. Yd. *d* stp. st. 2 A. elev.
6. March. and run.
7. Str. forw. ly. 2 A. ext. (sidew. and) upw.
8. Wg. F. high gr. ½ st. T. backw. flex.
9. Str. turn wlk. *b* st. 2 A. ext. upw.
10. Str. F. side gr. ½ st. sidew. flex.
11. Wg. fallout *c* Heel elev.
12. 2 Cr. hg. 2 L. elev.
13. Continuous sidew. vault. over bar.
Inside pommel vault on horse.
Run. high jump.
2 A. and L. flg. upw. jump. — "Start!"
14. Turn st. 2 A. elev. forw. upw.
Yd. *d* std. st. 2 A elev. and 2 Kn. flex.

XVII.

1. Turn std. st. 2 A. elev. forw. upw.
Wg. wlk. *b* st. 2 Kn. flex. in ser.
St. 2 A. ext.
Str. st. slow 2 Kn. flex.
2. Gr. arch st. 2 hand trav. downw.

3. Spiral serp., down H. first (vert. ladder).
4. Rest toe st. 2 Kn. flex. to sitt.
   St. 2 A. elev. sidew. w. L. elev. sidew.
5. Rch. turn fallout *a* 2 A. flg. upw.
6. March. and run.
7. Bend forw. ly. 2 A. ext. upw.
8. Rest ly. 2 L. abd.
9. Rest turn std. st. backw. flex.
10. Str. side gr. ½ st. L. elev.
11. Wg. heel gr. ½ st. T. forw. flex.
12. Ov. gr. ½ Kn. hg. swing up to bal. ½ sitt.
13. Cr. hang. vault through 2 bar (near together).
    360° twice upw. jump.
    Yd. *c* toe ½ st. hopg.
14. Fallout *b* 2 A. elev. forw. upw.
    Yd. *a* st. 2 A. flg. and ½ step. forw.

XVIII.

1. Yd. *a* st. 2 A. flg. and ½ step forw.
   Wg. wlk. *d* st. 2 Kn. flex. in ser. 2 A. ext.
   Rest. std. st. slow 2 Kn. flex.
2. Gr. arch cr. *b* ½ st. 2 A. flex.
3. Single rot. trav. on oblique rope.
4. Rest cr. *a* ½ st. Kn. ext. forw.
   Yd. *c* st. L. elev. sidew. w. heel elev.
5. ½ str. yd. *d* stp. st. 2 A. elev.
6. March. and run.
7. Str. fallout *b* T. forw. flex.
8. Bend fall. F. gr. ½ st. 2 A. ext. upw.
9. Str. turn wlk. *c* st. 2 A. ext. upw.
10. Str. st. T. flex. sidew. ov. bar. w. L. elev.
11. Wg. toe sup. wlk. *b* st. Kn. flex.
12. 2 cr. *b* hg. 2 L. abd.
13. Pole vault.
    Outside pommel vault. on horse.
    Run. long jump.
    1 step's start forw. jump.
14. St. 2 A. elev. sidew. upw. w. 2 Kn. flex.
    Yd. *a* fallout *b* 2 A. flg.

XIX.

1. St. 2 A. el. sidew. upw. w. 2 Heel elev.
   Wg. wlk. *a* st. 2 Kn. flex. in ser. 2 A ext.
   Str. std. st. slow 2 Kn. flex.
2. Gr. arch cr. *a* toe ½ st. Kn. ext. forw.
3. Climb vert. rope and "make fast."
4. Rest toe std. st. 2 Kn. flex. to sitt.
   Str. st. L. elev. sidew. w. hl. elev.
5. Yd. *c* stp. st. slow 2 A. ext. upw.
6. March. and run.
7. Str. forw. ly. 2 A. flg. upw.
8. Rev. stoop fall. pos.
9. Rest turn st. backw. flex.
10. Introd. to wheeling.
11. Wg. fallout *a* Heel elev.
12. 2 cr. hg. 2 L. elev.
13. Balance vault.
    Vault high bar w. rope.
    3 steps' start forw. jump.—"Stárt!"
    90° upw. jump.
14. Yd. *d* fallout *d* 2 A. elev.
    Close st. 2 A. elev. forw. upw. w. T. rot.

XX.

1. Close st. 2 A. elev. forw. upw. w. T. rot.
   Str. std. st. 2 Heel elev. in ser. 2 A. ext.
   Rest wlk. *b* st. 2 Kn. flex.
2. Str. arch st. 2 A. ext. upw.
3. Ov. gr. hg. 2 A. flex. to ½ rev. bd. bal. hg.
4. Str. wlk. *d* st. 2 Kn. flex.
   Rest st. L. elev. sidew. w. heel elev.
5. ½ str. rev. turn fallout *a* ch. zigzag forw. (backw.).
6. March. and run.
7. Str. F. gr. fallout T. forw. flex.
8. Str. fall F. gr. sitt. T. rot.
9. Str. fallout *a* (rev.) T. rot.
10. Str. std. st. quick sidew. flex.
11. Wg. instep gr. ½ st. Kn. flex.
12. Climb vert. rope, slide down H. first.
13. Handspring on saddle (bar).
    Vault to stand in the saddle (horse) and jump off forw.
    Run. high jump. w. 180° turn.
    Twice upw. jump—"Stárt!"
14. Yd. *a* fallout *d* 2 A. elev. forw. upw.
    Std. st. 2 A. elev. sidew. upw. and 2 Kn. flex.

XXI.

1. Yd. *d* st. 2 A. elev. and 2 Kn. flex.
   Str. wlk. *a* st. 2 Heel elev. in ser. 2 A. ext.
   Rest. wlk. *d* st. 2 Kn. flex.
2. Oblique gr. arch cr. *b* ½ st. 2 A. flex.
3. Bend ov. gr. hg. 2 hand trav. (bar).
4. Rest st. L. elev. sidew. and Heel elev.
   Bal. hg. rise to wlk. on hor. bar.
5. Rest fallout *b* T. forw. flex.
6. March. and run.
7. Rch. forw. ly. 2 A. flg. upw.
8. Rest F. high gr. ½ st. T. backw. flex.
9. Str. wlk. *c* st. rev. T. rot.
10. Str. rev. turn fallout *a* sidew. flex.
11. Yd. *d* crtsy. sitt. 2 A. elev.
12. Bd. cr. hg. trav. forw. w. 2 L. swing over bar.

13. Vault upper bar (2-bar). Handspring across box. Jump from bench and turn 90°. Twice sidew. jump. — "Start!"
14. Yd. *c* fallout *d* 2 A. circ. St. 2 A. elev. forw. upw. w. T. rot.

XXII.

1. Yd. *d* toe st. 2 A. elev. and 2 Kn. flex. Str. wlk. *b* st. 2 Heel elev. in ser. 2 A. ext. Rest stride st. slow 2 Kn. flex.
2. Oblique gr. cr. *b* toe ½ st. 2 A. flex.
3. Bd. und. gr. hg. 2 hand trav. (bar).
4. St. 2 A. elev. sidew., L. elev. sidew. and heel elev. Str. cr. *a* ½ st. Kn. abd.
5. Str. stp. st. slow 2 A. ext. upw.
6. March. and run.
7. Yd. *b* forw. ly. 2 A. flg.
8. Rev. stp. fall. 2 A. flex.
9. Rest turn close st. T. backw. flex.
10. Str. st. T. sidew. flex. w. L. elev.
11. Wg. fallout c Heel elev.
12. Stp. hg. somersault to high sitt. pos.
13. Leapfrog backw. on horse. Jump to stand in the saddle and jump off forw. Run. high jump. 90° twice upw. jump. — "Start!"
14. Yd. *d* turn fallout *a* 2 A. elev. Std. st. 2 A. elev. forw. upw. w. T. rot.

XXIII.

1. St. 2 A. elev. forw. upw. w. T. rot. Str. wlk. *c* st. 2 Heel elev. 2 A. ext. Bend toe st. 2 A. ext. upw. and 2 Kn. flex.
2. Oblique gr. arch. st. L. elev. and heel elev.
3. Bend ov. gr. hg. 2 hand trav. on hor. ladder.
4. Yd. *d* st. 2 A. elev., L. elev. sidew. and Heel elev. Str. hor. ½ st. pos.
5. Rest turn fallout *a* T. forw. flex.
6. March. and run.
7. Str. forw. ly. 2 A. elev.
8. Rch. fall F. gr. sitt. 2 A. flg. upw.
9. Yd. *c* std. st. quick T. rot.
10. Wheeling.
11. Rest st. 2 Heel and toe elev.
12. 2 cr. *b* hg. 2 A. flex. (hor. bar).
13. Vault to "stand over." Inside pommel vault across box. Str. gr. ½ st. jump from stallbars. 180° twice upw. jump. "Start!"
14. Turn fallout *a* 2 A. elev. forw. upw. Yd. *d* toe st. 2 A. elev. and 2 Kn. flex.

XXIV.

1. Yd. *d* toe st. 2 A. elev. and 2 Kn. flex. ½ str. backw. rch. alt. A. flg. upw. Str. wlk. *d* st. 2 Heel elev. in ser. 2 A. ext.
2. ½ str. gr. wg. arch st. 2 Heel elev.
3. 2 rot. trav. on oblique rope.
4. Bend st. 2 A. ext. upw., L. elev. sidew. and heel elev. Rch. cr. *b* courtesy ½ sitt. ch. L. by jump.
5. Bend hor. ½ st. slow 2 A. ext. upw.
6. March. and run.
7. St. 2 A. flg. forw. upw. and fallout *d* backw.
8. Rev. stp. fall. w. living support.
9. Str. turn wlk. *a* st. T. backw. flex.
10. ½ str. F. gr. sidefall. L. elev.
11. ½ str. yd. gr. hor. ½ st. Kn. flex.
12. Bend 2-gr. cr. *b* hg. sag. trav. on bar.
13. Lengthwise inside pommel vault. Side-vault on horse (face forw.). Run. long jump. 1 step's start, 90°, forw. jump. — "Start!"
14. Yd. *a* arch st. 2 A. flg. Yd. *c* turn fallout *a* 2 A. circ.

XXV.

1. Yd. *a* turn st. 2 A. flg. Str. std. st. 2 Kn. flex. in ser. 2 A. ext. ½ str. rev. turn fallout *a* zigzag forw.
2. Str. arch turn wlk. *a* st. 2 A. ext. and ch. F.
3. Rot. trav. on hor. bar.
4. Rest toe st. alt. Kn. upw. flex. Str. hor. ½ st. to Rch. cr. *b* crtsy. ½ sitt.
5. A. flg. forw. upw. and fallout *d* forw. change forw. in one count.
6. March. and run.
7. Yd. *d* forw. ly. 2 A. elev.
8. Str. F. high gr. ½ st. T. back. flex.
9. Str. std. st. quick T. rot.
10. Sidew. hg. pos.
11. Wg. fallout *c* change feet backw.
12. Stoop hg. vert. trav. on ropes.
13. Handspring lengthwise (box). Leapfrog backw. (horse). Run. high jump. Sidew. forw. jump. 2 A. and L. flg. upw. jump. — "Start!"
14. Yd. *a* arch st. 2 A. flg. and F. pl. forw. St. 2 A. elev. forw. upw. and 2 Heel elev.

COMPLETE INDEX TO THE NOMENCLATURE

A. = arm (for arm-movements see pp. 110 to 113 and 146 to 168).
abd. = abduction (pp. 80, 125, 302, 303).
abdominal exercises (p. 168).
add. = adduction (pp. 125, 302, 303).
alt. = alternate (pp. 68, 79, 117, 151).
arch. = the trunk bent backward (Fig. 57, p. 89).
arch-flexions (p. 85).
arch hang. = the body is suspended by the arms, the toes resting on the floor behind (Fig. 106, p. 129).
B. = back.
backw. = backward.
bal. = balance.
bal. hang. = Fig. 103, p. 126, and Fig. 209, p. 226.
balance-mov'ts (p. 56).
bend = bd. = "arms upward — bend!" (Fig. 80, p. 110).
betw. = between.
ch. = change.
circ. = circumduction (pp. 158, 271).
climb. = climbing (pp. 130 to 143 inclusive).
close st. = "feet — close!" (see p. 51).
close toe st. = Fig. 31, p. 66.
courtesy st. = the knees are bent to 90° (Fig. 36, p. 69).
courtesy sitt. = the knees are bent to utmost flexion (Fig. 39, p. 71).
cr. = crook = hips (and knees) bent to 90°.
cr. hang. = crook hanging: — Figs. 96, 97, 99, 100, 101.
cr. ½ st. } crook half standing: — standing on one leg, the other raised for-
cr. hlf. st. } ward with hip bent to 90° (Fig. 50, p. 78).
crosswise st. = crosswise standing (Fig. 24, p. 61).
dir. = direction.
elev. = elevation.
ext. = extension.
F. = foot.
fall. = the trunk inclined backward (Figs. 157 and 158, p. 174).
fall. = falling.

fall hang. = fall hanging: — the body suspended by the arm; the heels rest on the floor in front (Fig. 105, p. 128).

fallout. = one foot in advance of the other; the distance between the heels equal to three times the length of the foot (or more); the forward knee bent, the backward one straight.

fallout *a* = Fig. 25, p. 63.

fallout *b* = Fig. 252, p. 269.

fallout *c* = Fig. 29, p. 65.

fallout *d* = Fig. 149, p. 164.

flex. = flexion.

flg. / **fling.** = flinging (pp. 153 to 156).

foot gr. = foot grasp: — one or both feet are inserted between the stall-bars or other apparatus (Figs. 26, 27, 160, etc.).

F. pl. = foot-placing (p. 62).

forw. = forward.

forw. ly. = forward lying: — lying face down ("prone lying") (Fig. 142, p. 160).

fund. = fundamental.

gr. = grasp: — the hands or feet grasp some apparatus.

H. = head (for head-movements see pp. 53, 54).

half / **hlf.** / **½** = half: — only one limb takes the position following this word.

heaving-movement, p. 106.

hlf. st. (= ½ st.) = standing on one foot (Fig. 52).

hang. / **hg.** = hanging: — for hg. pos. see pp. 114 to 143.

hor. = horizontal.

hor. hlf. st. = one leg raised backward to horizontal position in a line with the body, which inclines forward; the supporting leg is bent (Fig. 28, p. 65).

hor. stoop fall. = stoop fall (see below), except that feet and shoulders are on a level (Fig. 169, p. 181).

incl. = inclined.

incl. stoop fall. = stoop fall (see below), except that the feet are higher than the shoulders (Figs. 170 and 171, p. 182).

introd. = introduction (see pp. 41 and following).

jump. = jumping (jumping exercises, p. 208 and 216 to 228).

K. (Kn.) = knee.

Kn. st. = knee standing = kneeling (Fig. 157, p. 174).

L. = leg (for leg-movements see p. 60, etc., and p. 201, etc.).

(l.) = left.

lat. = lateral (lat. T. mov'ts. p. 187).

ly. = lying, the body extended, face up ("back lying").

march. = marching (for marching see p. 48, etc.).

mov. = movement.
osc. = oscillatory (pp. 29, 117, etc.).
pos. = position (pp. 36, 43).
prep. = preparation.
(r.) = right.
rch. = reach.
reach. = arms extended horizontally forward (Fig. 81 *b*, p. 111).
resp. = respiration (resp. exercises, p. 257).
rest. = the hands are locked behind the neck (Fig. 16, p. 52).
rev. = reverse.
rev. rot. = rotation of the trunk in direction of the backward foot (see p. 193).
rev. stoop fall. = "standing on the hands" (Fig. 173, p. 184).
rot. = rotation. — T. rot. p. 196. —— A. rot. p. 156.
run. = running (p. 50).
sidew. = sideways. — Sidew. flex. of T. p. 197; of H., p. 53.
sitt. = sitting.
st. = standing; if preceded by other abbreviations, it means that the parts not mentioned are in fundamental position.
star st. = feet and arms are apart, so that the position resembles a star (Fig. 194 and 207).
std. = stride (see below).
stoop. (stp.) = the trunk bent forward (Fig. 58, p. 90).
stoop fall. = stoop falling: — hands and feet are on the floor (Fig. 168, p. 180).
stoop hang. = hanging with feet up, head down (Fig. 93, 95, 113, 114).
stp. = stoop.
str. = stretch: — the arms extended upward (Fig. 81, *a*, p. 111).
stride (std.) = the feet apart and on a level (Fig. 23, p. 61).
sup. = support: — the trunk resting on a firm support.
swim = swimming (p. 314).
swing. = swinging (p. 124).
T. = trunk (trunk mov'ts p. 187).
toe st. = the heels raised above the floor (Fig. 30, p. 66).
toe sup. = one foot has the heel raised above the floor (Figs. 40 and 149).
trav. = travelling (p. 116 and following).
turn. = the trunk rotated (p. 191 and 296).
und. gr. hang. = under grasp hanging (Fig. 85, p. 115).
und. hang. = under hanging: — one hand each side the bar, or hanging right under the apparatus (Fig. 98).
upw. = upward.
var. = various.
vault. = vaulting (for vaulting exercises see p. 228, etc.).
w. = with.
wg. = wing (Fig. 15, p. 52).

wlk. st. = walk st.:—one foot is in advance of the other; the distance between the heels is equal to twice the length of the foot; both knees are straight.

wlk. *a*, *b*, *c*, **st.** = Fig. 20, 21, 22, p. 60.

wlk. *d* **st.** = crosswise st. (see above).

Yd. = yard:—arms extended horizontally sideways (Fig. 82, p. 112).

Yd. *a* = Fig. 135 *a*, p. 154.

Yd. *b* = see note on page 153.

Yd. *c* = Fig. 140, p. 159.

Yd. *d* = Fig. 141, p. 159.

Yd. *e* = Fig. 137, p. 156.

½ = half (see above).

2 = double:—indicates that the limbs assume symmetrical posture.